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**REVIEW OF  
NEUROLOGY AND PSYCHIATRY**





# REVIEW

OF

# NEUROLOGY AND PSYCHIATRY

(FOUNDED BY THE LATE DR ALEXANDER BRUCE)

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# Review of Neurology and Psychiatry

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## Original Articles

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### THE PINEAL BODY: A REVIEW.

By LEONARD J. KIDD, M.D.

*Introduction; 1. Ancient Views of the Pineal Body; 2. Comparative Anatomy and Development; 3. Comparative Histology; 4. Clinico-Pathological; 5. Experimental; 6. General Discussion; 7. Conclusions; 8. References.*

#### INTRODUCTION.

THERE appears to be no really satisfactory review in the English language dealing with all aspects of the pineal body. Histological, experimental, and clinico-pathological evidence has been accumulating during the past few years—and even months—which suggests that the question is no longer, “Has the mammalian pineal body any functions?” but rather, “What are its functions, and how does it functionate?”

In this review my object is to so present the subject that we may learn by it the extent and the limitations of our present knowledge of pineal physiology, and may also learn in what directions this may be increased. In the clinico-pathological section I am not at all concerned with the purely intracranial signs and symptoms of pineal tumours, but only with the metabolic symptoms shown by about 10 per cent. of the recorded 65 cases.

#### 1. ANCIENT VIEWS OF THE PINEAL BODY.

The mammalian epiphysis was known at any rate in pre-Galenic ages; and Studnička<sup>5</sup> mentions that Faivre<sup>2</sup> (1857)



claims that Galen<sup>1</sup> and also Oribas knew of the existence of brain-sand in the human pineal body. The pre-Galenic teaching was that the pineal body acts towards the fourth ventricle in the same sort of way in which the pylorus acts towards the stomach, viz., that its function is to allow only the proper amount of the vital spirits to pass from the third to the fourth ventricle. Galen<sup>1</sup> refuted this ancient teaching: he writes of the pineal as a gland, similar to the other glands of the body. The statement is made by Paul Seigneur,<sup>6</sup> in his recent thesis, that Galen looked on the pineal as a gland which furnishes a secretion. I have failed to verify the latter part of this statement from a study of any of the three editions of Galen to which I have had access.\* But if Galen really did teach this, his foresight was truly remarkable. Seigneur states that Magendie revived the pre-Galenic teaching, and held that the pineal acts as a pad whose function is to open and close the Sylvian aquæduct. There is no need to refer in detail to the fanciful guesswork of Descartes (1649). It is stated by Faivre<sup>2</sup> (1854) that in 1680 Duverney announced to the Academy of Sciences that the dog has no pineal: this teaching was accepted by Samuel Collins in his "System of Anatomy," and also by Camper, but was refuted by Soemmering, Gisbert, and Jacob Wolff.

We can conveniently divide the history of the study of the pineal body into the following eras: (1) the pre-Galenic; (2) the Galenic; (3) the period of the dark ages ending about A.D. 1824; (4) an era of twilight, beginning in 1824, when the epiphysis of *Petromyzonts* was studied more or less by Serres (1824), Schlemm and D'Alton (1838), Johannes Müller (1839), Siebold and Stannius (1854), and Mayer (1864); and, finally (5) the modern era which began with the careful comparative histological studies by Faivre<sup>2</sup> (1854) of the mammalian, avian, and reptilian epiphysis.

It is said that the early history of the epiphysis is given by (1) Longet (1847), (2) Faivre<sup>2</sup> (1857 paper), (3) Legros<sup>3</sup> (1873), (4) Peytoureau<sup>4</sup> (1886-87), and (5) by Duval (1888). The references to Longet and Duval are given by Studnička.<sup>5</sup>

\* Apparently Seigneur relies here on the thesis of Peytoureau;<sup>4</sup> for in his bibliography he gives two references to Galen, and in each case adds "cit. par Peytoureau." I have to thank Mr Victor Plarr, the Librarian of the Royal College of Surgeons, London, for his kind help in translating passages from Galen.

## 2. COMPARATIVE ANATOMY AND DEVELOPMENT.

Although several observers studied the comparative anatomy of the epiphysis of lower vertebrates during the second and third quarters of the nineteenth century, the first really notable discovery appears to have been made by Leydig<sup>7</sup> in 1872: he then described a parietal sense-organ in *Anguis* and *Lacerta*, which he called "the frontal organ": he stated that there was no evidence as to its function. In 1882 Ahlborn<sup>9</sup> suggested that the parietal organ of Leydig is to be compared with the unpaired eye of *Amphioxus* and of *Tunicata*. In the same year Rabl-Rückhard<sup>8</sup> suggested the homology of this organ with the median eye of *Arthropoda*; and in 1884 he drew attention to the parietal foramen of fossil reptiles. These researches were soon followed by numerous studies of the development of the epiphysis, viz., those of de Graaf<sup>10</sup> (1886), Baldwin Spencer<sup>11</sup> (1886), Beard<sup>12</sup> (1888), Francotte<sup>13</sup> (1888), Béraneck<sup>14</sup> (1892, '93), C. Hill<sup>15</sup> (1891, '94), Dendy<sup>16</sup> (1899, 1907, 1911), and others. The most recent studies are those of Terry<sup>17</sup> (1910) in *Teleosts*, and J. Warren<sup>18</sup> (1911) in *Reptiles*.

So far as is at present known, an epiphysis is present in all vertebrates, with the exception of *Myxinoids* (Studnička), *Torpedo ocellata* (D'Erchia<sup>19</sup>), and *T. marmorata* (Studnička<sup>5</sup>), and all the *Crocodylia* (Sorenson,<sup>20</sup> Voeltzkow<sup>21</sup>). Not only is this true for the adults of these forms, but even in their ontogeny no trace of an epiphysis has been found—at any rate in the *Crocodylia*. In mammals the epiphysis appears as a single outgrowth or evagination of the hinder end of the roof-plate of the diencephalon. In lower vertebrates usually two epiphyses are seen at a very early stage of development: these are usually strictly median in position: the anterior one is developed in the anterior part of the diencephalic roof, and the hinder one in its posterior part. In most forms the anterior (epiphysis 1) becomes the pineal "eye" of those few forms which possess a recognisable one, whereas the hinder (epiphysis 2) becomes the pineal body. In other forms, the anterior either disappears or becomes fused with the hinder. It was formerly taught that the pineal eye is formed from the distal end of the epiphysis, from which it is constricted off; but few modern writers accept this view. Most authorities hold that two epiphysial evaginations occur: of these, the anterior is the future pineal sense-organ or eye, the posterior the "epiphysis." But some observers argue for a primitive bilateral origin of the pineal eye and epiphysis (pineal organ), so that they were originally paired structures. Thus, Gaskell<sup>22</sup> maintained that the pineal sense-organs of the *Ammocetes* of *Petromyzon* were paired organs. Dendy<sup>16</sup> states that in *Petromyzonts* the hinder epiphysis is much more developed than the anterior, and is actually median in position; he found that in *Geotria australis* (the New Zealand fresh-water lamprey) the anterior organ lies a little to the left of the median line: the posterior becomes the pineal eye and is connected by the "pineal nerve" with the right habenular ganglion.

Locy<sup>23</sup> (1893, '94) described in the Selachian *Acanthias vulgaris*

two pairs of symmetrically developed "accessory optic vesicles," behind the optic vesicles, on the open neural plate. He held that these are serially homologous with the optic vesicles: he derives the pineal pair from the more anterior pair of these accessory vesicles. His observations have, however, never been confirmed on embryos of this easily accessible Selachian. In 1891 C. Hill<sup>15</sup> found in *Teleosts* and in the Ganoid *Amia* right and left primary epiphysial outgrowths. Dendy<sup>16</sup> found (1899) that, in that very primitive type of reptiles *Sphenodon*, the left epiphysial vesicle becomes the parietal eye. Béraneck<sup>14</sup> described right and left epiphysial outgrowths in *Lacertilia*, and strenuously maintained the doctrine of the individuality of the pineal eye. John Cameron<sup>24</sup> showed that, in the chick, at about the fiftieth hour of incubation the epiphyses appear as bilateral outgrowths from the roof of the diencephalon, the left being the larger: by the sixtieth hour the two outgrowths have coalesced to form the single unpaired outgrowth. He points out that the transitory appearance of the bilateral condition explains why it had been previously overlooked. He found the same state of affairs in *Amphibia*. I note, however, that in very early stages in reptiles Warren<sup>18</sup> found the two epiphyses strictly median in position from the first. It is only right to mention here that Cameron,<sup>24</sup> who strongly champions the "primitively bilateral origin" hypothesis, has shown in *Teleosts*, *Amphibia*, *Birds*, and *Man*, nerve-fibres passing from the ganglion habenulæ of one side to epiphysial elements on the opposite side, forming a true decussation in the superior (habenular) commissure. Dendy<sup>16</sup> admitted candidly in 1899 that at present it is not possible to explain why these two organs (epiphysial vesicles) should so persistently tend to alter their positions from the primitive transverse to the sagittal plane. He draws attention to the fact that in the Devonian fossil fish *Titanichthys* there are paired parasagittal parietal foramina present.

The variations of the vertebrate epiphysis are very great. For the following compilation I am indebted especially to Studnička's monumental paper,<sup>5</sup> and to Dendy's excellent one<sup>16</sup> on the pineal gland in "Science Progress."

1. *Adult Elasmobranchs*.—In *Spinax niger* the epiphysis is a median, unpaired body in the form of a long slender tube which passes forwards and ends in a terminal enlargement lodged in the cartilaginous roof of the cranium. Studnička describes its walls as containing numerous modified columnar ependymal cells whose free extremities project slightly into the lumen of the organ.

2. *Ganoids*.—In *Acipenser* (sturgeon) the structure resembles that of Elasmobranchs.

3. *Teleosts*.—The same thing is true here also; but the proximal part is much shorter, and its terminal vesicle is usually larger, and may have its wall much folded. C. Hill<sup>15</sup> describes, in the Salmon, numerous cells, resembling ganglion cells, in the wall of the vesicle.

4. *Amphibia*.—(a) Urodela—have a single pineal organ: it apparently represents the proximal part of the stalk of a more fully developed pineal organ, such as occurs in fishes. (b) Anura—the

pineal organ is single, but has both a proximal and a distal vesicular part. The former contains the usual modified ependymal cells with their free ends projecting into its cavity.

5. *Reptilia*.—Of existing forms, only *Sphenodon* and *Lacertilia* have a pineal eye: but a parietal foramen was present in many extinct forms. In *Ophidia* the pineal organ is a solid, very vascular body, and resembles that of birds and mammals.

6. *Aves*.—The epiphysis may be tubular, follicular, or solid; and it is usually connected with the brain by a hollow or a solid stalk. In *Meleagris* there are vast numbers of small follicles, lined by ependymal epithelium, and separated from one another by vascular connective-tissue; and Studnička has demonstrated the presence of ependymal cells with their free extremities projecting into the cavities of the follicles.

7. *Mammalia*.—The pineal body usually resembles that of birds, and is very vascular; but there are great variations, sometimes even in closely related forms: the recent studies<sup>54</sup> of Cutore (1912) show this well: thus, he finds great macroscopic differences between the pineals of *Macacus* and *Cercopithecus*. Again, the study by Jordan<sup>57</sup> (1911) of the epiphysis of the Virginian Opossum shows a very primitive type quite reptilian in character.

In summing up this section, we may say that it is clear that the morphology of the epiphysial organs is not yet fully understood, and that it presents problems of great difficulty.

### 3. COMPARATIVE HISTOLOGY.

[I have made free use of the monographs of Mdlle. Dimitrova<sup>50</sup> and of Studnička<sup>5</sup> in the following section: to several papers I have not had access, but in these instances I have been at pains to compare as many abstracts of these as I could find. Dimitrova gives an excellent historical summary up to 1901; and Studnička summarises the literature of the histology of the mammalian pineal under six headings, viz.: (1) Connective-tissue framework; (2) Ependyma; (3) Parenchyma—neuroglia; (4) Nerve-bundles in the epiphysis; (5) Ganglion-cells(?); (6) Pigment in the epiphysis.]

v. KÖLLIKER<sup>25</sup> (1850) described small round cells, multipolar nerve-cells, compact bundles of cells, and a few nerve-fibres.

FAIVRE<sup>2</sup> (1854) was apparently the first observer who made a careful comparative histological study of the pineal body. [Curiously, this paper is not mentioned by Dimitrova, though she quotes Faivre's later paper of 1857—a paper to which I have not had access.] Faivre studied the pineal of Man, horse, guinea-pig, dog, ox, rabbit, pig, the hen, turkey, turtle-dove, and the tortoise; unfortunately he gives no figures. He refutes the teaching that the parenchyma is composed of grey matter analogous to the cortical substance: superficial examination, even, shows the error of this; he quotes Valentin ("Neurologie," p. 222) that the pineal has a striking histological resemblance to the pituitary. Faivre describes the pineal of Man as formed of three

elements, viz., (1) the fibro-vascular envelope, which sends many prolongations into the interior, (2) the globular or nuclear parenchyma, (3) the brain-sand or inorganic material. Of these, the parenchyma is the most important. The parenchyma is formed essentially of a large quantity of "globules"; these, full of grains ("grenus") in their interior, are generally elliptical with irregular borders; their diameter averages  $\cdot 015$  mm. He says that these globules do not call to mind the structure of the histological elements of the nervous system, and that comparative histology shows that the "globules" are the nuclei of the cells. I interpret these descriptions to mean that Faivre recognised that the nuclei of the parenchymal pineal cells of Man contain granules; if this be correct, he was the first observer to make this discovery. [I find that practically all modern writers appear to have overlooked this earlier paper of Faivre, probably because Dimitrova has no mention of it; and it is certain that everyone who wishes to learn about pineal histology consults her paper's historical summary.] It is of interest to note that Faivre found the "globules" were smaller in a girl of 3 years than in a woman of 60. In the horse he found throughout the parenchyma a large number of small black granules ("grains") endowed with remarkable Brownian movement. Its globules are much larger than Man's, viz.,  $\cdot 02$  mm.; some differences between the pineals of the horse and of Man are mentioned.

He notes that the guinea-pig's pineal is easily missed; it is very small (2 mm. length), slender, and easily torn out in preparation; its ovoid granules are  $\cdot 012$  to  $\cdot 006$  mm. in diameter, i.e., slightly smaller than in Man, and are full of blackish "granulations": Faivre found also small grains of calcium phosphate, and of concretions whose nature he failed to determine. The dog's pineal resembles Man's; its globules are very small ( $\cdot 004$  to  $\cdot 006$  mm. in diameter). The hen's pineal has the ordinary globular structure: the small "grains" are rounded, and are from  $\cdot 001$  to  $\cdot 002$  mm. in diameter: their contents are sometimes granular, but more often they appear to be surrounded by a whitish zone which seems to be the cell of which they are the nucleus. Other birds resemble the hen, both as to the position and structure of the pineal. At the end of his paper Faivre states that in all the animals which he examined, viz., mammals, birds, and reptiles, he got the same results. He appears, then, to have been the first to establish two facts which are now recognised by modern histologists, viz., (1) that the nuclei of the parenchymal pineal cells contain granules, and (2) that there are certain histological differences in the pineals of the child and of the adult.

In his second paper (1857) he is stated by Dimitrova<sup>60</sup> to have "described round the gland a connective-tissue sheath coming from the choroid plexus, and fibro-vascular septa which penetrate into its thickness and divide it into a large number of cavities. These are occupied by the special elements, which are distinct from those which enter into the composition of the nervous system but approach the nerve-elements of invertebrata and of embryos. In Man and the horse Faivre has found nerve-elements in the pineal peduncles; he finds also

concretions, which are, he thinks, due to the rich vascularity of the organ."

LOCKHART CLARK<sup>26</sup> (1861) found nerve-fibres, nuclei, and brain-sand, but no nerve-cells. He writes: "Its reticular structure bears a decided resemblance to the epithelium of the olfactory mucous membrane and still more to what I have described elsewhere as the fourth layer of the olfactory bulb in the sheep, and particularly in the cat."

LUTS<sup>27</sup> (1865) looked on the pineal as formed of grey matter and of nerve-fibres which are connected with various regions of the brain.

LEYDIG<sup>28</sup> (1866) says that the structure of the mammalian pineal, especially of the mouse, resembles that of the pituitary body of reptiles, with certain small differences, however.

KRAUSE<sup>25</sup> (1868) described nerve-fibres with a double contour.

STIÉDA<sup>29</sup> (1869) studied the pineal of birds and mammals, and described an anastomosis of the processes of the pineal cells; and he found nuclei in the reticulum.

BIZZAZERO<sup>30</sup> (1871) described two sorts of cells; and he appears to have been one of the first to discover—as many observers have since found—that there are certain differences between the cells of the pineal of newly-born animals and those of adults. He found often a yellowish or brownish pigment in the connective-tissue cells; he found no true septa, but only irregular trabeculae.

MEYNERT<sup>31</sup> (1871) looked on the pineal as a nerve-ganglion.

HAGEMANN<sup>32</sup> (1871-72) studied fishes, birds, and mammals; he described two kinds of epithelial cells, viz., round and fusiform; also bipolar and multipolar nerve-cells. Thus he regarded the pineal body as composed of a mixture of epithelial cells and nerve-elements.

CRUVEILHIER<sup>33</sup> (1877) found (1) pale rounded cells without processes, (2) multipolar cells, (3) a small number of nerve-cells, and (4) a multitude of calcareous concretions.

MIHALKOVICZ<sup>34</sup> (1877) says that developmental studies show that the pineal cells are not lymphatic corpuscles; they are in their origin homologous with the epithelial elements of the cerebral ventricles.

SCHWALBE<sup>35</sup> (1881) held that there is a striking resemblance between the pineal cells and those of lymphatic corpuscles; but he regarded them as, developmentally, modified epithelial cells.

CIONINI<sup>36</sup> (1885-86) demonstrated—apparently for the first time—the presence of neuroglial elements; the few nerve-fibres met with belong to the vessels.

DARKSCHEWITSCH<sup>37</sup> (1886), who studied the frog, rabbit, dog, ape, and human foetus, describes and figures in the dog medullated fibres connecting the pineal and the posterior commissure. He describes great abundance of nerve-fibres. He used Weigert's hæmatoxylin method.

HENLE<sup>38</sup> (1887) looked on the pineal as a lymphatic ganglion: he described its parenchyma as containing two kinds of cells, viz., (1) round cells which resemble lymph corpuscles or leucocytes (but are a little larger), and (2) angular cells provided with points.



ELLENBERGER <sup>39</sup> (1887) describes the horse's pineal as very vascular; under a low power it resembles in structure a lymphatic gland. Only rarely did he find nerve-fibres in the pineal: they are continued into its stalk, but he failed to trace them to their termination.

FLESCH <sup>40</sup> (1888) studied the pineal of horse, sheep, pig, dog, bat, and Man; he found brain-sand only in Man. He denied that the pineal of mammals is a rudimentary organ, and regarded it as an epithelial organ: he found nerve-fibres. He points out that the size of the pineal bears no relationship to the size of the brain; thus the small-brained sheep has a relatively large pineal. He argued that the mammalian pineal is physiologically active, because (1) it contains nerves, (2) is very vascular, (3) its specific cells contain pigment-granules. He held that it was probably a secretory organ. He suggests that it may also contain a heat-regulating centre.

EDINGER <sup>41</sup> (1889) says that in higher mammals the pineal is formed of neuroglial cells, and that nerve-elements are absent.

CHAUVEAU <sup>42</sup> (1889) finds in the connective-tissue, vesicles filled with polyhedral cells.

MINGAZZINI <sup>43</sup> (1889) claimed that the pineal elements resemble lymphatic corpuscles.

SOURY <sup>44</sup> (1889) found a substance, resembling adenoid tissue, packing the spaces of the fine network and cellular elements.

WEIGERT <sup>45</sup> (1895), working by his own method, described the pineal cells as bound together by an abundant, but loose, network of large neuroglial fibres.

CAJAL <sup>46</sup> (1895) found sympathetic nerves penetrating the pineal body with its vessels: their axons form a rich interstitial plexus: the terminal nerve-twigs are situated on the external side of the glandular cells, but do not penetrate into their protoplasm; this relationship is like that found by several authors for other secreting glands.

GALEOTTI <sup>47</sup> (1896-97) argues for a secretory function of the pineal; and he appears to have been the first to attempt to show how this secretory process is carried out. He worked on the adult rabbit, also on an embryo white rat, of 14 mm. length, and on lower vertebrates. In the rabbit he described the parenchymal cells as irregularly disposed: their nucleus is oval, and is surrounded by a little granular protoplasm: pigment is often contained in the cells. Pigment-granules are found in both the cytoplasm and the nucleus of the cells: sometimes they are accumulated in the cytoplasm in notable quantity. Galeotti held that not only do the pineal cells elaborate pigment, but also, by different mechanisms, a product of secretion in whose formation the nucleus and nucleolus participate. Dimitrova <sup>50</sup> (to whose account chiefly I have had to trust) holds that these conclusions are unwarranted by Galeotti's observations. I find the statement is made by Foà <sup>81</sup> (1912) that Galeotti, applying his own elective coloration method, found abundance of "secretory" granules in the epiphysis of *Scyllium canicula*, *Leuciscus cephalus*, *Rana esculenta*, and in a nine days' embryo of *Gallus*; whereas he failed to find them in *Anguilla vulgaris*, *Spelerpes fuscus*, *Triton cristatus*, and *Proteus anguineus*.

LORD<sup>48</sup> (1899) described the parenchyma of the human pineal as formed of small stellate cells resembling those of adenoid tissue, and of pale elements of variable shape.

NICOLAS<sup>49</sup> (1900) found striped muscle-fibres in the pineal of the ox and calf, chiefly in the distal part: they may be superficial or deep, are very few in number, and easily found when large. Their size varies from 66 to 100  $\mu$  in length by 4 to 6  $\mu$  in breadth: they are accompanied by neuroglial fibres: and Nicolas never saw any connection of these muscle-fibres with vessels. His pupil, Mdle. Dimitrova, confirmed his results, in the following year, in all the six pineals of ox and calf which she examined. But no one else has since that time found striped muscle-fibres in any normal mammal.

DIMITROVA<sup>50</sup> (1901) studied the pineals of many mammals, young and old, by many methods; these included Man, ox, calf, sheep, horse, dog, and cat: all her observations were made on fresh glands: even her human material was never more than five hours old. She is the great champion of the essentially neuroglial nature of the mammalian pineal. She discusses the meaning of the intra-protoplasmic granules and the intra-nuclear droplets which she found. She writes: "If the presence of granules is sufficient to prove a glandular function, then the pineal cells are in the highest degree glandular." But she admits that her observations do not admit of a definite answer to the question of an internal secretion. She found that calcareous concretions were common and large in Man and the ox; pigment was specially frequent in the horse: it is found in the parenchymal cells and, more often, in the connective-tissue cells. Her conclusions may be summarised thus: (1) The pineal is composed essentially of neuroglial elements; (2) cavities exist in the pineals of ox, calf, sheep, and dog: they resemble thyroid vesicles, or the vesicles in the anterior lobe of the pituitary (she suggests that they represent vestiges of the primitive budding); (3) she found, in young cats only, some cells which are independent of the neuroglial cells: their significance is doubtful, but they resemble those which Cajal and Retzius have described as "sympathetic": she suggests that they are developing neuroglial elements; (4) she has never seen fibrils, of clearly nervous appearance, except in young animals: they could not be recognised in adults in the midst of the innumerable fibrils impregnated by the chromate of silver.

ANGLADE and DUCLOS<sup>51</sup> (1908-09) found neuroglia constantly in the human pineal: sometimes it appears to form an accessory support by connection with the connective-tissue: sometimes the septa are formed in great part by neuroglial elements: in the alveoli there are always neuroglial cells and fibres, but there are also probably cellular elements of another nature.

SARTESCHI<sup>52</sup> (1910), whose very important paper I know only by several abstracts, studied the pineal of birds and mammals (guinea-pig, rabbit, sheep, pig, cat, dog, ox, horse, and Man) both young and old. The pineal of the newly-born child differs from that of the adult. A pronounced glandular structure exists especially in birds; but only

in certain very young mammals—rabbit and guinea-pig—is it very definite: in the sheep, ox, horse, dog, and cat, secretory processes are not so evident, but Sarteschi holds that they cannot be denied. In the course of growth regressive changes occur, and these can be demonstrated histologically. The pineal of birds differs from that of mammals, and has a characteristic aspect. In *Gallus* glandular and neuroglial elements are found: the nuclei of the glandular cells are rich in fuchsinophile granules. The organ is divided by the connective-tissue septa into a large number of multilocular cavities, often irregular, in the central part of which is often seen a clear lacunar space, more or less large, in relation to which the glandular cells frequently take a radial disposition. In the interior of this space one sees numerous transparent spherules whose limiting membrane alone stands out prominently. Sometimes between the spherules there are irregular granular masses, at other times groups of elements exactly like glandular elements; the cell-body of these glandular elements has a spongy structure. The neuroglial elements appear specially evident about the capsule, and sometimes along the septa. In the pineal of the guinea-pig and rabbit most of the cells are polygonal, and have a spongy protoplasm; other cells, which present similar characteristics, are distinguished by their swollen appearance: and a clear space, full of liquid, is formed in the cell-body. One often sees spheres of various sizes, either isolated or grouped. In very young rabbits the pineal cells have abundant protoplasm, with a nucleus rich in fuchsinophile granules; in adult rabbits, these cells are rather scarce, the fuchsinophile granules are heaped up irregularly, and the nucleus is sometimes wanting. In adults the granules appear to undergo regressive changes; the protoplasm seems to be arranged in irregular granules, but little distinct: also the gland preserves its epithelial aspect in some parts only: usually large numbers of Cerletti's "perivascular corpuscles" are seen. The pineals of the sheep, young and old, ox and calf, and pig contain many neuroglial cells with long interlacing processes terminating among them: many typically glandular elements are also found. After a period of rapid evolution, their pineals undergo a regressive change in the adult.

COSTANTINI<sup>53</sup> (1910) studied the pineal of ox, horse, and Man: he notes that the pineal of the ox and horse is twice as large as Man's, though their brain is much smaller. He finds the organ is very vascular; he describes two sorts of cells, viz., acidophile and basophile; he lays great stress on the granular nature of the pineal cells, and concludes that the mammalian pineal is an organ with an internal secretion.

CUTORE<sup>54</sup> (1910) is stated to have found, in many mammals, in addition to neuroglial elements, cells of epithelial character, and also lymphatic elements. In *Macacus* he found abundant medullated nerve-fibres, which form a plexus: but he failed to find this in other mammals. The pineal of *Cercopithecus* shows an evidently glandular structure.

GALASESCU and URECHIA<sup>55</sup> (1910) describe by the name of

"paravascular acidophile" cells which they find round some of the vessels of the pineal: these cells are round or oval, with well-coloured nuclei, situated in the midst of a protoplasm which stains vividly with eosine, van Gieson's fuchsine, &c. The protoplasm, which is clearly delimited, contains sometimes fine granules; and sometimes it is so packed that the nucleus is indistinguishable. These cells resemble those of the parathyroids. The two writers suggest that these cells in the neighbourhood of the vessels may play a part in an internal secretion of the pineal body.

KRABBE<sup>53</sup> (1911) studied 100 human pineals, male and female: the ages of the subjects varied between 14 and 92 years: also some pineals from newly-born children, and some from children up to 7 years of age; but unfortunately he was not able to study any between the ages of 7 and 14 years. He found two types of cells in the parenchyma, viz., (1) special "pineal" cells, and (2) neuroglial cells. The former are much the more numerous: their nucleus is large and usually oval: there is but little chromatine, and that chiefly at the periphery: there is usually a nucleolus. The protoplasm is relatively slight in amount: the position of the nucleus varies. He thinks that granules leave the cell-protoplasm to traverse the intercellular spaces and enter finally the blood, or lymph, or cerebro-spinal fluid. On one point he feels certain, viz., that the nuclear products are not gathered by the paravascular granules, because these cells appear to be commoner in cases in which the parenchyma has been destroyed and consequently cannot be the path of nuclear secretion. Some of the nuclei are hollowed out; he supposes that the nucleus is regenerated after evacuation. In young subjects he sometimes found small groups of cells differing from the "pineal cells" in that the nuclei are very small and very rich in chromatine, the chromatic granules are very fine, and the cells are situated more deeply. These cells resemble those of the newly-born; and Krabbe looks on them as pineal cells which have retained their infantile characters. With regard to the neuroglial cells, he thinks that Dimitrova's interpretation of her own figures is not exact, for "it is not enough to say that a cell is neuroglial merely because it is in contact with neuroglial fibres." He gives reasons (p. 263) for his doubt. He goes on: "One must modify Dimitrova's teaching that the pineal is formed essentially of neuroglial elements, and say that its parenchyma consists of non-neuroglial cells between which there are a smaller number of cells (neuroglial) which give off a very large number of fibres which intersect the other cells." Krabbe describes also other cells, and certain variations of the connective-tissue of the pineal: he says there is no doubt that augmentation of this tissue is a process of involution, such as exists in the whole gland. He failed to find any relationship between the secretory process of the nuclei of the "pineal" cells and the augmentation of this tissue. He found, by the Kulschitzky-Wolters method, medullated nerve-fibres, not, however, in the parenchyma nor connective-tissue; but only at the base of the gland a small nerve-bundle, coming from the posterior commissure, possibly aberrant. He found calcifications, usually in the parenchyma, in a

few cases in the septa (small and elongated); pigment (lipochrome) in the connective-tissue, parenchyma, and in the cells whose nucleus is divided; fat, but never much, in the septa sometimes: it plays a less important part than the lipoid substances. He never found muscle-fibres; he often found, but not constantly, the neuroglial plaques described by Marburg<sup>68</sup> in 1909. Small cysts are common: only once were they as large as a pea: most were scarcely larger than a pin's head: they are always of the type described by Marburg as the result of central softening of the neuroglial plaques. Krabbe concludes that the pineal of Man shows signs of involution. To the signs described by previous writers, viz., concretions, proliferation of connective-tissue, and neuroglial plaques with their cysts, he would add a fourth, viz., the presence of cells of disintegration. The various forms of cells he found in the septa have certainly no productive function, they are rather the expression of involution of the pineal. On the other hand, he finds evidences which suggest that the adult human pineal has a function. He has been struck by the integrity which the pineal of Man shows from early adult life to extreme old age. Ordinarily, involution begins towards the age of 7 years: but even at 92 years Krabbe found no greater changes than at the age of 14 years, with the exception of sclerosis of vessels. While it is true that degenerative processes are seen in the young, it is also true that the pineal even of the old shows signs of a function. In only one case did he find total degeneration. If the pineal has a function, it lies in its parenchymal "pineal" cells. Krabbe gives reasons why the evacuation of nuclear granules into the cell-protoplasm is not the expression of a degenerative process, thus: (1) the nucleus regenerates after evacuating its droplets; (2) other organs—*e.g.*, epididymis, pancreas of salamander—have similar processes of evacuation of products of secretion of the nucleus into the protoplasm; (3) these processes occur throughout life without the disappearance of pineal cells. He adds significantly that, if they represent a process of annihilation of the gland, it is surprising that the gland, after seventy years of annihilation, preserves almost the same appearance as that of one from a child of 14 years! He is rather sceptical on the subject of pineal syndromes: he thinks that pineal tumours may possibly have an action (? trophic) on nerve-centres situated near the pineal gland. He tried—in a single rabbit—the effect of an injection of pilocarpine on the pineal, which was subsequently examined histologically; but he was not able to draw any conclusions from his findings.

JORDAN<sup>57</sup> (1911) gave an excellent description of the microscopic anatomy of the epiphysis of the Virginian Opossum, both male and female adults. Macroscopically, it is a simple tubular evagination of the roof of the third ventricle; it thus recalls the embryonic form of the epiphysis of lower vertebrates, and appears to represent a condition of primitive or arrested development. Jordan finds two types of epiphysis in the opossum, viz., (1) the short tubular or cup-like type, such as is seen in lower mammals and carnivora especially, and (2) the long tubular type of birds and reptiles. These types are

illustrated. The opossum's epiphysis is much less vascular than the pineals of sheep and higher mammals. Delicate bundles of medullated nerve-fibres are discernible throughout the entire inter-commissural portion of the epiphysial region. The epiphysis proper shows a few small tubules or alveoli: in no case could they be traced into the lumen of the epiphysis. Neuroglial fibres are chiefly coarse or fine, but some are of intermediate grades: neuroglial cells are also found. On the question of a possible secretion, Jordan thinks that observations on the opossum's epiphysis indicate that the mammalian pineal is unimportant for body metabolism. He writes: "This is not necessarily an admission that it elaborates no secretion which may even exert specific effects, but only that it is not essential either directly or indirectly for the normal conduct of the vegetative functions, as are the secretions of other of the better understood ductless glands."

In November 1911 Jordan<sup>57</sup> followed up his paper on the opossum by a very suggestive study of the histogenesis of the pineal body of the sheep. He studied six stages in all, from that of a 5 cm. embryo (about the second week) to the 21 cm. stage (about 2½ months, i.e., half way through gestation). He studied also the pineals of the animals at term, of lambs aged about 8 months, of yearling sheep, and of old sheep. The pineal at term is exactly like that at 8 months, except that the latter is larger. At half way through gestation the alveoli and melanic granules are most abundant. At term the sheep's pineal is very vascular. At 8 months of age it attains its maximum size (about 8 × 5 mm.). Jordan writes: "The greatest increase in bulk (approximately five-fold) during the first year indicates that, if the pineal body has a specific function, this is most active in the young; and the suggestion frequently made that the body is a gland which elaborates an internal secretion which has to do with the normal growth or the appearance of maturity (sheep mate at from 6 to 8 months) receives support from anatomical facts." He found increase of size in the pineals of young children, i.e., in an infant of 5 days it was 3 × 2 × 1 mm.; in youth it is largest, about 7 × 5 mm.; in old age considerably smaller. The abundance of melanic granules found half way through gestation "indicates that the secretory activity of the 'gland' may be greatest at this stage of development." Jordan failed to find chromaffin cells, which some authors describe, in the pineal; most workers (according to my own reading) agree with Jordan on this point. He could not find any striped muscle-fibres. "Nor do the trabeculae here contain smooth muscle-fibres as noted by some investigators for certain forms (e.g., ox; Illing,<sup>59</sup> 1910)." He failed also to find nerve-cells; and pigment-clumps occurred only in old sheep. Contrary to Dimitrova's negative findings, he found brain-sand in the proximal portion of the pineals of yearling sheep, and a large amount in old sheep. After the first year the sheep's pineal becomes slightly smaller (6 × 4½ mm.); this lessening in size is accompanied by a decrease in the parenchymal cells and an increase in the connective-tissue and neuroglial elements. In old sheep there are evidences of several degenerative changes. Jordan has a long



description and discussion of the cytoplasmic granules: the nucleus contains only chromatic granules, the cytoplasm only melanic granules. He concludes that there is no cytologic evidence in favour of a secretory function of the sheep's pineal; but he is careful to point out that "its general structure (*i.e.*, lobulation, connective-tissue framework, arrangement of parenchyma into follicles, presence of blind alveoli, large perivascular lymph-spaces, great vascularity, and presence of granules in the cytoplasm) indicates a glandular function of the nature of elaborating an internal secretion. The parenchymal cells are all of one type: more or less highly differentiated ependymal cells, giving origin to neuroglia cells and fibres, and inter-neuroglia cells." He interprets the cysts and the melanic cytoplasmic granules as having probably only an ancestral significance. The importance of his paper is very great.

BIONDI<sup>58</sup> (1912), whose work I know of merely by a single brief abstract, studied the avian pineal, chiefly (I believe) that of the adult hen, by Golgi's arsenious acid method; the parenchymal cells were studied by another method for the demonstration of mitochondria. He appears to describe granules in the parenchymal cells of the hen's pineal which he is inclined to look on as mitochondrial formations; but he seems to admit that the matter is not yet quite settled. One may recall here the fact that P. Mulon has described (*Compt. Rend. d. l. Soc. d. Biol.*, 1911, i., p. 652) in the cortex of the adrenal of many mammals an internal secretory process in which mitochondria elaborate a complex lecithalbumen which is discharged from the cells into the blood-stream. This is of special interest because there is some evidence in favour of the view that the cortical adrenals are connected with the sex-functions and probably bodily growth also; a relationship with the pineal body is thus suggested, but its exact nature is at present unknown.

I have not attempted to give any detailed account of the important 1909 paper of Marburg,<sup>58</sup> as I know of it only by scattered and fragmentary references by other writers; but some of his findings are noticed in my account of Krabbe's paper<sup>56</sup> (1911), and Münzer<sup>87</sup> seems to rely largely on Marburg's paper in his own general survey of the pineal body.

After this histological section was written, an important paper by Funkquist<sup>60</sup> appeared on the morphogeny and histogenesis of the pineal organ in birds and mammals. He worked by numerous methods: and his technique is fully described. His studies included the hen, duck, diver, canary, and sparrow; the ox, pig, rabbit, rat, hedgehog, and cat. The turkey-cock is also mentioned once. The variations in both classes are considerable. In birds and mammals the epiphysis is developed as a pocket-shaped outgrowth from the roof of the pars parencephalica (*v.* Kupffer) diencephali, which later is changed into a tubular structure of varying length. In certain birds (diver) this separates often from its connection with the brain. In both classes two types of epiphysis are found, *viz.*, (1) a simple tubular one: its growth is by enlargement of its circumference and thickening of its

walls: it is found in sparrow, canary, opossum, and ox; (2) a budding tubular form: in many instances the tubules are detached from the pineal pocket; this type is found in diver, duck, hen, rat, hedgehog, cat. Originally, the embryonic epiphysis has an epithelial character: later its character is transformed into a neuroglial tissue. Two types of cells are described, viz., ependymal cells, and astrocytes. The author never found brain-sand in avian or mammalian embryos, but only in adult mammals: he found plenty in a 3-year-old mare, in older oxen, cows, and sheep. He never found true nerve-cells or fibres, nor muscle-cells. He suggests that what some authors have taken for muscle-cells may really have been a "myoid" development of neuroglial cells.

#### 4. CLINICO-PATHOLOGICAL.

Out of about sixty-five recorded cases of tumours of the pineal body metabolic symptoms and signs have been present in about 10 per cent. To these metabolic cases I shall refer, and also to two cases recorded by Pellizzi,<sup>71</sup> and to one of the two cases of sexual precocity recorded by Machell.<sup>72</sup> Among other lesions which occasionally involve the pineal body, either primarily or secondarily, are, according to Seigneur,<sup>6</sup> (1) hypertrophy (Virchow, Meckel, Esterlen, Lieutaud, Morgagni, Blanquique, and Marburg; other ancient cases are said to be given by Legros<sup>3</sup>); (2) atrophy (Morgagni, Laignel-Lavastine—an unpublished case); (3) cysts, of which Marburg<sup>68</sup> recognises two varieties: Virchow and older writers also record cases); (4) hæmorrhages (Ziegler, Simon); (5) syphilis (Lord,<sup>48</sup> possibly Pontoppidan); (6) abscess (Birsch-Hirschfeld).

The cases of pineal tumours with metabolic symptoms may be classified as (1) cases occurring in very young male children associated with bodily, sexual, mental, and vocal precocity; (2) cases associated with obesity; (3) mixed cases. But needless repetition would be necessary if the cases were detailed according to such a grouping. I propose, therefore, to give the cases in chronological order.

#### GUTZEIT'S CASE <sup>61</sup> (1896).

A boy of 7½ years, strongly built and well developed, showed abundance of pubic hair during the last eight months of his life when intracranial signs were present. Pappenheimer <sup>64</sup> states—without giving any particulars—that other marked signs of precocity were present. [I have not had access to Gutzeit's paper; and all the many abstracts of it, which I know, are very meagre.] Autopsy showed a teratoma of the pineal, which had compressed the corpora quadrigemina.

? HEUBNER'S CASE<sup>62</sup> (1898-99).

I have not had access to the publication in which Heubner records this case. There are great discrepancies between various writers about the case; thus, Bailey and Jelliffe<sup>63</sup> describe it as a separate case from that of Cestreich and Slawyk (see below): whereas Seigneur<sup>6</sup> describes the case as the case of Heubner and of Cestreich and Slawyk. The similarity in the autopsy findings in the (two?) cases suggests that Seigneur is right. Heubner's case is generally described as being in 1898 a  $4\frac{1}{2}$ -year-old boy: yet he seems to become in 1899 a 4-year-old boy! I find in Cestreich and Slawyk's paper no mention of Heubner's name. But v. Frankl-Hochwart<sup>69</sup> writes of Heubner's case as "published by Cestreich and Slawyk"—"a 4-year-old boy." Marburg<sup>68</sup> (1908) has no mention of Heubner's case, but he refers to the case of O. and S. as a  $4\frac{1}{2}$ -year-old boy. Raymond and Claude<sup>70</sup> say the boy was 4; they too ignore Heubner's name in connection with the matter.

It is stated by Pappenheimer<sup>64</sup> that in 1898 Heubner reported, before a German Society in Düsseldorf, the case of a boy of  $4\frac{1}{2}$  years, who in his last illness showed a marked development of pubic hair and growth of the genitals. From other abstracts I gather that the large size of the penis and testes, and the pubic hair, appeared with the intracranial symptoms. It is said that Heubner showed a photograph of the patient. It is also said that the case was later examined by Cestreich and Slawyk. Autopsy: a cystic psammo-sarcoma of the pineal.

CESTREICH AND SLAWYK'S CASE<sup>65</sup> (1899).

A boy of 4 years of age. Birth with forceps: was a long time asphyxiated: laryngismus at 3 months. He developed normally during his first year. When 1 year old, had convulsive attacks. When he was 3 years old, the formerly bright boy showed a strikingly quiet and shy disposition: he sat in the corner most of the time, and cried much. At this time he began to grow quickly and vigorously, and his bodily overgrowth was excessive. His penis developed enormously: this was attributed by the parents to masturbation, but there was no proof of this. When 4 years old, the boy looked 7 or 8, was very bony and muscular, and had plenty of fat: his skin was of natural colour. Height 108 cm. (3 ft.  $6\frac{1}{2}$  in.), i.e., about  $6\frac{1}{4}$  in. too tall for his age. Weight 20 kilos, i.e., 4 too much. Mammary glands hypertrophic, contained colostrum, and measured 2 cm. ( $\frac{4}{5}$  in.) in height. The flaccid penis measured 9 cm. ( $3\frac{9}{16}$  in.) in length. Testes as large as a pigeon's egg. Abundance of dark pubic hair, 1 cm. ( $\frac{2}{5}$  in.) long. Extremities of natural length, and no thickening of phalanges. Mentally, he was quiet but not sad, and somewhat precocious ("altklug"). Towards the end of his illness his weight rose to 22.3 kilos, and then slowly sank to 19.5 kilos. Definite intracranial symptoms appeared during the last four weeks of life. [This statement differs from Pappenheimer's account<sup>64</sup> of the so-called

"Heubner's case": according to O. and S., genito-somatic overgrowth began at 3 years, and lasted for twelve months: then appeared signs of intracranial disease: the importance of these points is very great.] Autopsy: a cystic psammo-sarcoma of the pineal. The pituitary, thyroid, adrenals, and pancreas were normal, both macroscopically and microscopically. The thymus showed no visible pathological changes: it was 7 cm. long,  $3\frac{1}{2}$  wide, and 1 cm. thick.

C. OGLE'S CASE <sup>66</sup> (1899).

His case 2 was a boy of 6 years, who had been strange in his manner for the last few months, had masturbated, and had slept much. His penis was the size of that of a boy of 16 or 17: pubic hair fairly plentiful: testes "did not seem enlarged." Autopsy: an alveolar sarcoma of the pineal, with hæmorrhages: the pituitary was normal microscopically.

M. NEUMANN'S CASE 2 <sup>67</sup> (1901).

A boy of 11 years had acute symptoms like those of tuberculous meningitis only ten days before his death. There was slight development of the external genitals. Autopsy: a cystic sarcoma of the pineal.

MARBURG'S CASE <sup>68</sup> (1908).

A girl of 9 years began to grow fat about one year after the earliest intracranial symptoms appeared. The adiposity was great on the chest and abdomen: the fat was more than 5 cm. thick (2 in.): no other anomalies of growth were present, and there were no genital or sexual changes. Measurements of height and weight are given. Death followed on operation. Autopsy: a mixed glio-sarcoma of pineal. The pituitary and all the other endocrine glands were normal. Marburg concluded that, as he found all these glands normal, and the pineal showed a multiplication of its glandular elements as well as of its neuroglial tissue, the adiposity was to be attributed to a hyperpinealism. And he enunciated the following three pineal syndromes: (1) hypopinealism (in early life) gives premature development, genital, sexual, somatic; (2) hyperpinealism gives adiposity; (3) A-pinealism, cachexia.

VON FRANKL-HOCHWART'S CASE <sup>69</sup> (1909).

A boy of  $5\frac{1}{2}$  years with marked genito-somatic, psychical, and vocal precocity. His father and two paternal uncles had persistent branchial clefts: a sister a hæmangioma of the labium: a younger brother a nævus on leg. When the patient was 3 years old he began to grow rapidly and excessively, and showed mental precocity. When 5 years old he was heavy and stout, and looked 7 years old: at this time his mental precocity reached a truly astonishing degree; thus, he spent much time in discussing the question of the immortality of the soul, and the life after death: these ideas and subjects were not suggested

to him by his relatives or friends. He was sensitive and good-hearted. It was at this time (5 years 1 month) that he showed his first signs of intracranial disease (August 1908). Early in December 1908 he showed great development of the penis, strong erections, marked growth of pubic hair, and moderate growth on tibiae: his voice was extraordinarily deep, and resembled that of a boy's breaking voice at puberty. He was seen by v. Frankl-Hochwart on 13th January 1909, *i.e.*, nine days before death. He then showed subcutaneous fat, and strong bony development: height 123 cm. (4 ft.  $\frac{1}{2}$  in.), *i.e.*, that of a boy of 9 years: penis 7 cm. long (2 $\frac{3}{4}$  in.): pubic hair equal to that of a boy of 15: testes the size of a hazel-nut: no axillary hair. The diagnosis was "tumor cerebri destroying the pineal." Autopsy: a pineal teratoma, composed of neuroglial elements, papillary granulations, epidermic globes, and hyaline cartilage. Pituitary microscopically normal.

#### RAYMOND AND CLAUDE'S CASE <sup>70</sup> (1910).

A boy aged 10 years: birth normal: family history good. At the age of 7 years he was rather large, and his intelligence was very much developed. At age of 8 his stature was above the average, and his size was rather big. He then became fat and weak: the adiposity continued for a year or more. When examined at the age of 10 by the authors, his figure was a little swollen and bloated ("bouffie"), and his colour slightly pale. Height 138 cm. (4 ft. 6 $\frac{1}{2}$  in.), *i.e.*, that of a boy of 13 or 14. Weight 39 kilos (average is 25 or 26): and the parents affirmed that he had been for six months losing flesh. There was adiposity of abdomen, thighs, and lumbar region: his cheeks were chubby. Mental apathy: but he answers questions well, perhaps slightly better than most boys of his age: memory good: slight depression: but otherwise his psychical state was good. He had pubic hair, equal to that of a boy of 14 or 15: and slight down on cheeks and upper lip. But the penis was very short and small, and the testes very small. The diagnosis of pineal tumour was made. Autopsy: a glioma of the pineal. Pituitary small: its glandular elements, however, were normal in appearance: "still its glandular functions were certainly impeded": the diminution of its size was attributed to mechanical compression. The testes measured 10 x 8 mm.; they showed no evidence of spermatogenesis: their interstitial tissue was over-developed. The testes were microscopically abnormal for his age and for the general degree of good bodily development. The adrenals showed changes:—the cortex contained nodules like hypernephroma, *viz.*, groups of cells forming a rounded nodule, and containing fat; the medullary substance was also very well developed, and contained very many more eosinophile cells than normal. These changes pointed to a general hyperfunction of the adrenals. The pancreas was normal, with well-developed islets of Langerhans. The thyroid body was rather small, but showed no other obvious changes. The authors discuss the question of pineal syndromes, and conclude that adiposity and genital troubles are really due to a pluriglandular syndrome,

There are several recorded cases of pineal tumours, verified by autopsy, in which some degree of adiposity has been noted: but I think no good purpose would be served by further reference to them. In my opinion, it is not yet proved that adiposity is ever of purely pineal origin. Incidentally, this point will be referred to in the section on experimental procedures.

There are, however, still three cases which deserve mention here, though it is true that the existence of any pineal lesion, gross or functional, in them is unproved.

#### PELLIZZI'S PRECOCIOUS GENITO-SOMATIC PINEAL SYNDROME (1910).

Under this title Pellizzi<sup>71</sup> has described two cases in young boys. [I greatly regret that I have not had access to his paper; and in the only abstract of it, known to me, no statement is made whether intracranial disease was found: for aught I know to the contrary, both children may be still alive.]

*Pellizzi's Case 1.*—In the abstract there is no mention of the boy's general health: this may mean that it was quite good. Marked bodily overgrowth began at the age of 7 months: at age of 2 years penile erections and seminal emissions: *the semen was proved to contain spermatozoa*: no sexual libido accompanied the emissions: no onanism. The genitals resembled those of a man: the pubes was moderately covered with hair: there was a suggestion of a moustache. Psychical condition good, corresponded with that of an older child. Radiography showed a condition as of a youth of 16 or 17: but the dentition showed the true age. The abstract contains no further particulars.

*Pellizzi's Case 2.*—The abstract says that the history was less reliable than in case 1. In this boy bodily overgrowth began at the age of 2 years. He was hydrocephalic, and his mental capacity was very limited. The genital development corresponded approximately to that of case 1. (This last sentence is not exactly satisfying, and no further particulars of the case are given in the abstract.) The presence of hydrocephalus of course makes us think here of a tumour of, or involving, the pineal. But in case 1 there is an alternative possibility which will be referred to in the section of this paper on the "General Discussion."

#### MACHELL'S CASE 2<sup>72</sup> (BOY) OF SEXUAL PRECOCITY (1911).

In January 1912 I abstracted this case in *The Review of Neurology and Psychiatry*, and suggested that a pineal lesion was probably present: this I will discuss in my general discussion.

A boy showed pubic hair at the age of 5 months: erections one year later: emissions when 2½ years old. His father, aged 33, weighed 12 lbs. at birth, and developed early: he is now, however, only 5 ft. high, and weighs in clothes only 103 lbs.: he is the small one of the family: he has three brothers of normal size, the youngest of whom

developed early: he has also two sisters, who menstruated at the usual age and are of average height and weight. A photograph of the patient shows pubic hair and great penile development, and a very finely built sturdy frame of good proportions. His weight at 4 months of age was about  $7\frac{1}{2}$  lbs. too great: at 8 months 12 lbs. too great: at 12 months 13 lbs. too much: at 3 years 20 lbs. too much. At the age of 44 months his height was 3 ft.  $9\frac{1}{2}$  in. ( $8\frac{1}{2}$  in. too much). At age of 4 years his head was 2.3 in. too large in circumference: his chest nearly 5 in. too large in girth: his penis measured  $2\frac{7}{8}$  in. when lax: it was very large when erect: emissions, both spontaneous and on manipulation. Mental precocity very marked: disdains toys of tiny tots: habits those of much older boys: manner independent: he is perfectly self-possessed with strangers even, answering questions in a loud, bass, stentorian voice. Machell makes no mention of the boy's general health: it seems probable, then, that it was good. The boy was born in February 1906: he was therefore less than 6 years old when Machell's paper was published (November 1911).

Directly I read Machell's paper I was struck by the extraordinarily close resemblance of his case 2 (boy) to v. Frankl-Hochwart's case,<sup>69</sup> so far as the bodily, genital, sexual, mental, and vocal development was concerned. In my general discussion I shall refer to Machell's case again, and show that, as in Pellizzi's case 1, there is one, and only one, other lesion besides a pineal lesion that, in the present state of our knowledge, is to be thought of.

By the kindness of the Editor of this *Review* I am able to draw attention to an important case which came to my notice after my MS. was sent in. I refer to the case recorded by E. Cecil Williams (*Proc. Roy. Soc. of Med.*, section of study of Disease in Childhood, Vol. 6, Nov. 1912, p. 24). It was one of precocious development in a boy aged 6 years.

About November 1911 the boy began to develop quickly: he was admitted to hospital in May 1912. At that time his weight was 4 st. 2 lbs.; height 4 ft. 2 in.; he has a slight moustache; his voice is deep, like an adult's; the muscles of his arms and his trunk are well developed; he can lift heavy weights; he is slow of intellect and movement, and cannot run as other boys of his age do; he is inclined to knock-knee, and his tibiae are inclined to be curved. Pubic hair is abundant, but there is none in the axillae; his external genitals are fully developed. All these changes are shown in a photograph. No tumour can be felt in the abdomen, and there is no bronzing of the skin. His blood-pressure is high (110 mm. Hg.). His urine is normal. The head-circumference is  $21\frac{1}{2}$  in. The boy put on 11 lbs. in weight during his five weeks' stay in hospital. Fresh measurements were taken

in October 1912; the particulars given show marked increase of weight, height, and of neck and chest measurements. The author discusses the possibility of a tumour of the cortex of the adrenal or of the pineal body. A skiagram of the skull was thought to indicate a slight enlargement of the sella turcica and pituitary fossa. The president of the section thought that there was also an early development of the sphenoidal sinuses: unfortunately, the skiagram is not given. It is stated that in October 1912 the boy's general health is excellent; but there is no mention of the reason why he was admitted to hospital in May 1912; possibly the state of his lower extremities was the reason. It is noted that the ocular fundi were normal.

The special interest of this case arises from the suggestion that a lesion of the pituitary body, or of its neighbourhood, may be present. If subsequent study should prove this to be the case, then it will be the first case on record in which a pituitary lesion has led, either directly or indirectly, to the macro-genito-somatic precocious syndrome in a boy of the early age of six years. Further, we should then have to modify our conceptions of this syndrome in boys under the age of seven years, and to say that in such cases three possible diagnoses are open, viz., (1) a lesion of the pineal body, (2) of the adrenal cortex, (3) of the pituitary body. Everyone will notice the striking difference between the mental precocity and independent manner of Machell's case and the slowness of intellect of Williams' case. It seems probable that the inability to run in Williams' case is due entirely to the state of the boy's lower extremities.

(To be concluded.)

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## Abstracts

### ANATOMY.

#### THE HISTOLOGY OF THE CRANIAL AUTONOMIC GANGLIA OF

- (1) **THE SHEEP.** F. W. CARPENTER, *Journ. of Comp. Neurol.*, Vol. xxii., October 15th, 1912, p. 447.

THE chief object of this study was the peripheral endings of the pre-ganglionic fibres. The nerve-terminations were demonstrated by the intra-vitam staining with methylene blue. In addition, Cajal's silver nitrate method was used for the otic ganglion: some of its cells are fenestrated, resembling in this respect certain ciliary ganglion cells of mammals and birds (Sala, von Lenhossek) and certain spinal ganglion cells of mammals (Cajal). Conclusions:—(1) The sphenopalatine, otic, and submaxillary ganglia of

the sheep contain multipolar cells with long, slender, frequently branched dendrites which extend for considerable distances beyond the limits of the cell capsules: they thus resemble the ordinary type of mammalian sympathetic cells. (2) In the ciliary ganglion the only cells in which processes were clearly differentiated by methylene blue possessed each a single, heavy, branched dendrite. (3) In all the four cranial autonomic ganglia the preganglionic-axons terminate on the cell-bodies of the post-ganglionic neurones in sub-capsular peri-cellular end-nets of fine varicose fibrils; these end-nets vary in complexity: a given ganglion may show both a comparatively simple ending and complete intricate networks (these are figured). These endings are similar to those of pre-ganglionic fibres in the vertebral and pre-vertebral ganglia of the sympathetic system.

LEONARD J. KIDD.

**CONTINUITY IN THE VERTEBRATE NERVOUS SYSTEM, AND**

- (2) **THE MUTUAL AND INTIMATE CONNECTIONS BETWEEN NEUROGLIA AND NERVE CELLS AND FIBRES.** (*La doctrine de la continuité dans l'organisation du névraxe chez les vertébrés, et les mutuels et intimes rapports entre la névroglie et les cellules et les fibres nerveuses.*) G. PALADINO, *Arch. Ital. de. Biol.*, lvi., 1911, p. 225.

PALADINO, who has been studying neuroglia for twenty years, holds that the disagreements on the mutual relationships of nerve cells and fibres are directly due to imperfect knowledge of neuroglia and of its intimate connections with nerve cells and fibres. In the present study he used the iodide of palladium method chiefly. The following is a much shortened summary of some of his twelve conclusions: (1) Nerve cells are in continuation among themselves by proximal and distal connections of varying degree and diverse directions: the cell-processes divide at first into two or three branches or into numerous brush-like ones. (2) The double genetic origin of neuroglia (Ford Robertson) is accepted, viz., ectoglia from ectoderm, and mesoglia from mesoderm. (3) Neuroglia-cells anastomose among themselves and are directly inter-connected by their processes proximally and distally: they are thus connected with both neighbouring and distant glia-cells. (4) Neuroglia forms round nerve cells a peri-cellular network, continuous with the interstitial neuroglia, and penetrates the cell-body to form an endo-cellular network whose threads are fine and meshes narrower than those of the peri-cellular network. (5) Neuroglia is applied to the cell-processes, and constitutes a myeline framework for the medullated fibres, often to a considerable distance. (6) The nerve-cells of the electric lobes of *Torpedo* show, in old age, vacuolisation of varying degrees: if extreme, they are reduced to a thin layer of protoplasm, with

excentric and finely granular nucleus without nucleolus or chromatin network. In these cases the penetration of the neuroglia into the cell-bodies can attain exceptional proportions (these points are well figured). (7) The neuroglia, with its peri-cellular and endo-cellular networks, in continuation with each other and with the interstitial neuroglia, represents not only a supporting and isolating mechanism, but also a nutritive apparatus which serves, by the interstices of the endo-cellular network, for the more intimate distribution of the plasmatic juice in the elements of the nerve-cells. This paper has twelve figures, and is the author's summary of his Italian paper (*Rend. d. R. Accad. d. Sci. Fis. e. Mat. di. Napoli*, f. 7-9, 1911). LEONARD J. KIDD.

### PHYSIOLOGY.

**BRONCHO-DILATOR NERVES.** W. E. DIXON and F. RANSOM, *Journ. (3) of Physiol.*, Vol. xlv., No. 5, Dec. 9, 1912, p. 413.

IN these experiments on cats the Dixon-Brodie oncometric method of recording the changes of lung volume during artificial respiration was used: two methods of producing anæsthesia were adopted. In order to exaggerate the effects of vagal stimulation and to produce a small degree of bronchial tonus, the authors employed physostigmine in small doses: the bronchial tonus which the physostigmine induces passes off in about an hour, and a further dose was necessary if the experiment was not completed. The following are their conclusions:—(1) The bronchial muscles are supplied by powerful broncho-dilator nerves which are sympathetic in origin. (2) The fibres proceed mainly through the rami of the 1st, 2nd, and 3rd thoracic nerves, are connected with nerve-cells in the ganglion stellatum, and proceed to the lungs with the cardiac accelerators. A variable number of fibres pass down the cervical sympathetic, and these, too, have their cells in the ganglion stellatum. (3) Some crossing of fibres to the bronchioles of the opposite lung is the rule. (4) Very occasionally evidence was found of broncho-constrictor fibres in the sympathetic of the neck, and of broncho-dilator fibres in the vagus. The effects are always insignificant, and are held to be due to each nerve containing some fibres arising from the other. (5) Reflex broncho-dilatation was obtained by exciting the central end of the vagus nerves after section of both, and of the cut central end of the accelerator nerves, also after section of the vagi, this being a crossed reflex. (6) The broncho-constrictor fibres in the vagus cross to a variable extent, but some crossing is the rule. (7) Reflex broncho-constriction was obtained by exciting the central end of one vagus, the central end of the accelerators, and the

central end of the anterior crural nerve. (8) Adrenalin administered to an animal showing bronchial tonus causes active temporary dilatation; atropine causes passive permanent dilatation.

LEONARD J. KIDD.

**THE PART PLAYED BY THE SUPRARENALS IN THE NORMAL**

- (4) **VASCULAR REACTIONS OF THE BODY.** G. von ANREP, *Journ. of Physiol.*, Vol. xlv., No. 5, Dec. 9, 1912, p. 307.

THE existence of secretory fibres to the adrenals, running in the splanchnic nerves, has been established by Biedl, Asher, Cannon, and Elliott. In this experimental study on dogs the author exposed the splanchnics extra-peritoneally from the back, and a string was passed round each adrenal in order to exclude either or both as quickly as possible from the circulation by tying the string. Anæsthesia was by morphia and A.C.E. To exclude any possibility of reflex on the heart, all its nerves were cut. Both vagi were divided in the neck, and the stellate ganglia were extirpated from the back by Anderson's method; usually no pneumo-thorax was produced. The author concludes:— (1) Stimulation of the splanchnic nerves by any means, as shown by Johansson and others, causes a rise of blood-pressure which occurs in two phases. The second phase, as Lehnendorff found, is accompanied by constriction of peripheral blood-vessels (even after denervation) and by acceleration and increased tone and augmentation of the heart (also after denervation). (2) The secondary rise, and all the concomitant phenomena, are due to the discharge of adrenalin into the circulation, and are absent after extirpation of both suprarenals. (3) Every rise of blood-pressure, brought about by the agency of the nervous system, thus involves the co-operation of the chemical mechanism represented by the suprarenal glands.

LEONARD J. KIDD.

**Note 4. FURTHER OBSERVATIONS ON VASOMOTOR PHENO-**

- (5) **MENA.** (Observations ultérieures sur les phénomènes vasomoteurs.) M. CAMIS, *Arch. Ital. de Biol.*, lvi, 1911, p. 277.

IN this experimental research Camis destroyed the labyrinth in rabbits by the method of C. Winkler ("The Central Course of the Nervus Octavus and its Influence on Motility," Amsterdam, 1907). The motor phenomena corresponded exactly with those described by Winkler, viz., forced positions of head and eyes—head flexed towards operated side, eye on operated side turned downwards and inwards, that of sound side turned upwards and outwards, nystagmus, etc. Difficulty was experienced in keeping the rabbits alive for more than a few days. In all his twenty-four animals Camis found a vasodilatation of the pinna of the operated

side: this usually disappeared on the third day. Since he found also narrowing of the palpebral fissure, paralysis of the nictitating membrane, and myosis on the operated side, he proceeded to test by experiment whether he had accidentally wounded the cervical sympathetic. He refers to the findings of S. J. and Clara Meltzer (*Amer. Journ. of Physiol.*, ix., 1903, p. 252) that, in rabbits, after section of the cervical sympathetic or extirpation of the superior cervical ganglion, together with section of the third cervical nerve of that side, hypodermic injection of adrenalin causes a slight permanent vaso-constriction of the homolateral ear with either no change, or slight vaso-dilatation, in the heterolateral. He therefore applied this method to labyrinthectomised rabbits. In all cases he found that the results agreed in the main with those found in sympathectomised rabbits. Conclusions:—(1) Destruction of the rabbit's labyrinth gives rise to a vaso-dilatation of the homolateral pinna, of two or three days' duration; (2) when the two ears have regained equal conditions of vascularity hypodermic injection of medium doses of adrenalin gives a vaso-constriction only in the ear of the operated side; (3) the vessels of the ear of the operated side do not react to excitation, nor to section, of the cervical sympathetic.

LEONARD J. KIDD.

**THE ACTION OF ADRENALIN ON THE PULMONARY VESSELS, AND THE VASO-MOTORS OF THE LUNG.** (L'action de l'adrénaline sur les Vaisseaux pulmonaires, et le vaso-moteurs du poumon.) L. PLUMIER-CLERMONT (*Acad. de Méd. de Belgique*, Sept. 28, 1912), *La Presse Méd. Belge*, No. 44, Nov. 3, 1912, p. 884.

In 1904 the author found that adrenalin has a vaso-constrictor action on the pulmonary vessels of the dog. He has repeated his experiments, in view of the fact that Heger and Philippon have recently failed to confirm his conclusion (*v. Review*, x., Sept. 1912, p. 441). He confirms his own earlier work, and concludes that a vaso-motor apparatus exists in the lungs, but is much less developed than that of the general vascular circuit.

LEONARD J. KIDD.

**THE EFFECT OF ADRENALIN ON THE PULMONARY CIRCULATION.** E. M. TRIBE, *Proc. Physiol. Soc.*, Oct. 19, 1912, p. xx. (*Journ. of Physiol.*, Vol. xlv., No. 5, Dec. 9, 1912).

In this preliminary communication Tribe records the results of his experiments on any possible variation in the action of adrenalin on the lung vessels of mammals, birds, and reptiles. With Parke-Davis' adrenal chloride solution, 1:1000 in normal saline with 0.5 per cent. chloretone as a preservative, he obtained in all animals a distinct, but not intense dilatation. With the crystalline

adrenalin of Parke-Davis, however, he got almost always a marked constriction, as Wiggers did previously: the exceptions were due to failure to keep the lungs at the body temperature. Tribe experimented further on nearly thirty cats by the method used by Dixon and Brodie (1904). He confirmed his previous results. He suggests that the chloretone in the "adrenalin chloride" is probably an important factor in producing that preparation's dilator effect; but on this point he insists on the need for further work. He writes:—"In any case the main question as to the existence of vaso-motor nerves in the lungs is still undecided, since it is doubtful if the constriction obtained in the lung vessels is comparable to that of organs known to possess vaso-motor nerves, where a violent constriction is obtained with minute amounts of even the adrenalin chloride preparation. These investigations are being pursued."

LEONARD J. KIDD.

#### **HYPOPHYSIAL GLYCOSURIA AND ADRENALIN GLYCOSURIA.**

- (8) (*Glycosurie hypophysaire et glycosurie adrénalique.*) H. CLAUDE and A. BAUDOUIN, *Compt. Rend. Soc. de Biol.*, lxxiii., No. 37, Dec. 27, 1912, p. 732.

THE writers used exactly the same procedures, and obtained exactly similar results, with adrenalin as they did in the same subjects with extract of hypophysial posterior lobe (*v. supra*). They always injected only 1 mg. of Parke-Davis solution of hydrochlorate of adrenalin (1:1000). In some of their patients the adrenalin glycosuria was more marked than the hypophysial, in others the opposite held good. As a rule the hypophysis extract gave a rather larger amount of sugar, whereas adrenalin gave a rather larger flow of urine. The writers conclude that in therapeutic doses adrenalin glycosuria is an alimentary glycosuria, as they had previously shown is the case with hypophysial glycosuria. And in these doses it acts, like hypophysis extract, by hindering fixation of glucose in the liver in the form of glycogen.

LEONARD J. KIDD.

#### **CONTRIBUTIONS TO THE PHYSIOLOGY OF THE LABYRINTH.**

(Contributions à la Physiologie du Labyrinthe.)

##### **Note 1. THE ERGOGRAM OF THE LABYRINTHECTOMISED FROG.**

- (9) (*L'Ergogramme de la grenouille privée du labyrinthe.*) M. CAMIS, *Arch. Ital. de Biol.*, lv., 1911, p. 172.

EWALD obtained an asymmetrical position in the cadavers of labyrinthectomised pigeons. Emanuel found that traction on the foot of a normal frog and of a dead frog respectively gave characteristically different curves: further, the curve in bilaterally labyrinthectomised frogs resembled the cadaveric, whereas after unilateral operation both feet showed curves intermediate between



the normal and the cadaveric. Camis operated on thirty frogs by Schrader's method: he took ergograms of the gastrocnemius from one to seventy-five days after the operation. He found peculiar oscillations of tonus, sometimes very irregular: these occurred only from the third to the seventh day after labyrinthectomy. Reference is made to Gaglio's findings that cocainisation of the pigeon's semicircular canals gives the same results as their section or destruction. Camis confirms this for the frog: he also shows that cocaine, applied through the acoustic bulla on the side of labyrinthectomy, abolishes the oscillations of tonus. Conclusions:—(1) The labyrinthectomised frog shows irritative phenomena as well as those of defect: the former consist of transitory oscillations of tonus of skeletal muscles (gastrocnemius) which are homolateral after destruction of one labyrinth, bilateral after destruction of both labyrinths. (2) Local application of cocaine abolishes these oscillations of tonus of labyrinthine origin. (Several ergogram-tracings are given.) LEONARD J. KIDD.

**Note 2. A METHOD OF OPERATION FOR DESTRUCTION OF THE**  
 (10) **SEMICIRCULAR CANALS OF THE DOG.** (*Un methode opératoire pour la destruction des canaux demi-circulaires du chien.*)  
 M. CAMIS, *Arch. Ital. de Biol.*, lv., 1911, p. 180.

THE method commonly used destroys the cochlea and the middle ear; even the method of Fano and Masini destroys the latter, and is difficult and uncertain in its results if one wishes to spare the cochlea. Camis has devised an operation, based on exact anatomical studies in the dog, here fully described and illustrated, in which the lesion is limited to the semicircular canals; it has given him excellent results: numerous autopsies show that it effectually destroys the labyrinth without injury to the nerve-centres. Having found in his dogs a characteristic position of the head, viz., turned towards, and flexed on, the operated side, he performed a control operation:—he carried out the first part of the operation which comprises the exposure of the neck-muscles: no asymmetry of the poise of the dog's head followed. The paper is essentially one for the experimentalist. LEONARD J. KIDD.

**Note 3. EFFECTS OF LABYRINTHECTOMY IN THE DOG,**  
 (11) **ESPECIALLY ON THE VASOMOTOR INNERVATION.**  
 (*Effets de la labyrinthectomie chez le chien, particulièrement sur l'innervation vaso-motrice.*) M. CAMIS, *Arch. Ital. de Biol.*, lvii., F3, Sept. 16, 1912, p. 439.

THIS note was delayed in publication for many months. The semicircular canals were destroyed in the dog by the author's method (*v.* note 2), sometimes on one side, sometimes on both; the bilateral operations were sometimes performed simultaneously,

but sometimes one side was operated on after a certain interval after operation on the other side. Many breeds of dogs were used: accounts of eleven operations are given.

Section 1 deals with general observations on the consequences of extirpation of the labyrinth in dogs: these may be summed up as phenomena of deficiency and of irritation: these latter were of short duration, and variable. The former, too, were transitory on account of a compensatory mechanism. The irritative phenomena are movements of rotation round longitudinal axis, of manège, of wheel-movement, and nystagmus. Those of deficiency, unmodified by time, were torsion of head and difficulty of leaping from a height. Those of deficiency, compensated in time, were narrowing of the pupil on side of operation, exaggeration of lateral head-movements, tendency to fall towards that side, impossibility of standing on hind-paws, and steppage gait.

Section 2 deals with the vasomotor reflexes of labyrinthectomised dogs. Camis studied the vasomotor reflexes of their hind limbs to determine (1) if the labyrinth has any influence on vasomotor phenomena, (2) if this influence regulates antagonistic innervation of muscles. He concludes that (1) unilateral labyrinthectomy leads to inversion of the vasomotor reflexes of the homolateral limbs, and bilateral to inversion on both sides, and (2) these consecutive vasomotor changes consist probably in functional abolition of the vaso-constrictor centre, for which reason there is lack of the reciprocal innervation on which the physiological rôle of vasomotor reflexes is based.

LEONARD J. KIDD.

**Note 6. ON THE MYOSIS AND THE PARADOXICAL MYDRIASIS**  
(12) **IN THE LABYRINTHECTOMISED CAT.** (*Sur la myose et sur la mydriase paradoxale chez le chat labyrinthectomisé.*)  
M. CAMIS, *Arch. Ital. de Biol.*, lvi., 1911, p. 319.

IN dogs and rabbits myosis was invariably found by Camis on the side of labyrinthectomy: its duration was approximately four to six days in dogs, and about three days in rabbits. For the cat, Winkler's operative method was adopted. The cat resembles the dog rather than the rabbit so far as the resulting motor phenomena are concerned. The homolateral palpebral fissure was markedly narrowed, the third lid paralysed, and the myosis very pronounced; these phenomena were constant (in many animals), and they resemble exactly those found in the cat after destruction of the cervical sympathetic. Meltzer found that, while hypodermic injection of even large doses of adrenalin has no effect on the eye of a normal cat when the cervical sympathetic has been previously divided on one side, or the superior cervical ganglion extirpated, adrenalin causes a retraction of the paralysed nictitating membrane,

Camis finds that adrenalin has a similiar action on the labyrinthectomised cat's eye: the probable mechanism is discussed. He concludes that here the adrenalin acts directly on the muscle of the iridic dilator.

Having reviewed here his previous experimental studies on the labyrinth, Camis suggests that we have now a new view of the functions of the semicircular canals. In place of the rather nebulous and artificial concept of labyrinthine tonus, we must conclude that they represent an organ on which, by their functional reciprocity, the precision and proper use (*l'économie*) of muscular movements depends. He does not, however, believe that his researches can destroy the concept of labyrinthine tonus: rather, they help us to understand that it is not a function *sui generis*, but a special manifestation of the general functions of the neuro-muscular system: excitation and inhibition. Further studies are to follow, and these conclusions form a working hypothesis which awaits the verdict of future experiments.

LEONARD J. KIDD.

**Note 5. THE GLYCOSURIA CONSECUTIVE TO DESTRUCTION (13) OF THE SEMICIRCULAR CANALS IN THE DOG.** (*La glycosurie consécutive à la destruction des canaux demi-circulaires chez le chien.*) M. CAMIS, *Arch. Ital. de Biol.*, lvi, 1911, p. 289.

DOGS of various breeds were used: the phenylhydrazine method was applied, with microscopical examination for crystals. A full description is given of the exact procedure, with accounts of many experiments. Camis discusses the glycosurias which follow operations, anæsthetics, and adrenalin-injections. He attributes great importance to irritation of the sympathetic system. He quotes many experimental facts which tend to show that glycosuria, determined by the most varied interventions, is always the consequence of direct or indirect sympathetic irritation. The post-labyrinthectomy vasomotor phenomena, previously described by him, are probably due to central effects. He concludes that (1) destruction of the semicircular canals in the dog determines a glycosuria, and (2) this glycosuria lasts for about seven days after operation, and the quantity of glucose seems to oscillate between .5 and 2 per cent.

LEONARD J. KIDD.

## PATHOLOGY.

**THE NEUROFIBRILS IN PELLAGRA, ACCORDING TO URECHIA.** (14) (*Des neurofibrilles dans la pellagre, d'après Urechia.*) MILLANT, *Arch. Internat. de Neurol.*, Nov. 1912, p. 312.

ALMOST the whole of this paper consists of quotations from Urechia's recent study ("Lesiunele Neurofibrilelor in Psichosa

Pelagrosa," 1911, Bucharest). Though many observers have studied the nerve-cells in pellagra, the neurofibrils have been neglected. In 1905 Marinesco described a special network in the pigmented portions of nerve-cells in leprosy and pellagra: it has remarkable powers of resistance to agents which are noxious to nerve-cells. In the same year Parhon and Papinian studied by Cajal's method the neurofibrils in a case of pellagra which showed cerebro-spinal changes: these were variable in the brain, and occurred mostly in some of the cells of Betz: neurofibrils were almost entirely absent: the cervical spinal cord was most affected. Obregia and Pitulescu (1909) studied in four mental cases the ganglia of the solar plexus by Bielchowski's method: they found greater changes than in G.P.I.: the fibrillar network sometimes disappeared entirely: cell-changes were also present. Urechia collected reports of fourteen autopsies: he found the neurofibrils affected throughout the whole extent of the nervous axis. The changes in the neurofibrils comprised reduction to a state of fine black granulations, especially in the cell-bodies, less often in their processes; often fragmentation, especially in Betz cells: sometimes they stick together and give an appearance of thick fibres: fatty degeneration is common. The fibrils are best preserved in the peri-nuclear zone of the cells. In the brain, the small pyramidal cells suffer most, those of Betz less, and the large pyramidal cells least. In the cerebellum, the fibrillar network of the Purkinje cells often shows fragmentation: the peri-nuclear zone is least affected. In the spinal cord the lesions are slight; in the root-cells more frequent and extensive. The spinal ganglia are little affected: rarely their cells with the neurofibrils form a wide-meshed network, fragmented or granular: Cajal's fenestrated cells are abundant: no irritative lesion is seen in their processes. In general, Urechia found enlargement of the fibrillar network of the cells, the fibrils granular and fragmented: in certain cells only a homogeneous coloured mass was seen, with some non-absorbed granulations towards the periphery. The neurofibrils are best preserved in the cell-processes: pigment is abundant, and the special network of Marinesco usually shows much resistance.

LEONARD J. KIDD.

**GENERAL PARALYSIS IN DOGS. (Paralysie générale du chien.)**

(15) L. MARCHAND and G. PETIT, *Arch. Internat. de Neurol.*, No. 5, Nov. 1912, p. 317.

THE writers have established the existence of a general paralysis in many dogs: it consists of a diffuse subacute meningo-encephalitis, often with associated cerebellar, bulbar, and spinal lesions. It is usually the result of the not yet isolated virus of

"the disease of early life," which goes on for many months before the characteristic symptoms appear. Two types occur: (1) the commoner dementia type, (2) the epileptic. A case of each type is fully detailed, with the autopsy findings. Usually, the dog shows progressive enfeeblement of intelligence, failure of memory (he may not know his own master), weakness, or loss of perception, indifference, automatism, dirty habits, bulimia, and loss of judgment: thus, he attacks ferociously his fellow, separated from himself by a partition, and violently injures himself. There may be agitation, or stupor. The former may occur at the onset, with change of character, surliness, and bad vision: more commonly it falls into a hebetude which persists to the end. The dog may even mutilate his own limbs (this occurred in a hyæna affected with meningo-encephalitis). The knee-jerks are exaggerated: general tremors: static and dynamic ataxia. Twice manège movements have been seen by the writers, due to a cerebellar hemiatrophy added to a meningo-encephalitis. Sensibility is blunted: a prick causes retraction without definite defensive movement. Inequality of pupils and myosis may occur. Some dogs cease to bark, apparently more from aphonia than from placidity of mood: others appear to be deaf. There is no fever. An unquestionable lymphocytosis is found. Anatomically, the nervous lesions are meningo-cortical, cerebellar, bulbar, spinal (especially of lumbar cord). The pia mater and the vessels are specially affected: these show subacute inflammation. There is perivascularitis of meninges and cortex, neuroglial sclerosis (specially in the molecular layer of cortex): the cortical cells are chromatolysed, especially in the motor area, and numerous lymphocytes are attached to their cell-bodies and their processes: the meninges are infiltrated with embryonic cells. The clinical symptoms vary according to the site, gravity, and extent of the lesions. Thus, a virus, other than that of syphilis, can in animals cause, by its nervous localisations, lesions and symptoms identical with those of human general paralysis. Three figures illustrate these changes. The paper is abstracted by the writers from their communications made at the Paris Congress of Comparative Pathology, October 1912. Its bearing on the "no syphilis no G.P." dogma is obvious. LEONARD J. KIDD.

**THE SUPRARENAL GLANDS IN ANENCEPHALY.** (*Nebennieren bei Anenzephalie.*) ROBERT MEYER, *Virchow's Archiv.*, Bd. 210, H. 1-2, 1912, S. 161.

THE author examined the suprarenals of anencephalics. In about half of his cases either one or both adrenals were atrophied. In all the cases the adrenals were smaller than normal, although morphologically some of them were normal. The parts generally affected are the inner layers of the zona fasciculata and zona

reticularis, which may be absent or not properly developed, although the zona glomerulosa and the part of the zona fasciculata adjacent may be quite normal and fat-containing. The author concludes from his observations that the changes in the suprarenals are related to the brain deformity, although what the causal factor is, is still unknown.

R. A. KRAUSE.

## CLINICAL NEUROLOGY.

- ANATOMICAL AND CLINICAL REMARKS ON FRANKE'S OPERATION IN TABETIC GASTRIC CRISES AND IN POST-HERPETIC NEURALGIA.** (Remarques anatomiques et cliniques sur l'opération de Franke dans les crises gastriques du tabes et les algies post-zostériennes.) SICARD and LEBLANC, *Rev. Neurol.*, August 15th, 1912, p. 157.

THE authors insist on the uselessness and the danger of Franke's operation, which consists in the avulsion of the intercostal nerves (usually the 5th to the 10th) as close to the vertebral column as possible, and give the results of experiments on the cadaver supporting their views.

S. A. K. WILSON.

- ON INTERMITTENT EXOPHTHALMIC GOITRE (IN TABES DORSALIS WITH BRONCHIAL ASTHMA).** Ueber intermittierende Basedowsymptome (bei Tabes dorsalis und Bronchialasthma). H. CURSHMANN, *Zeit. f. Klin. Med.*, Bd. 76, Heft. 3-4, 1912, S. 242.

A CASE of a tabetic patient who showed intermittent Basedow symptoms (such as exophthalmos, swelling of thyroid, tachycardia, sweating, tremors of hands, and increased blood pressure), which coincided each time with the onset of gastric crises. In this case the administration of adrenalin (3 to 10 drops of the 1:1000 sol.) per os, was of great benefit in relieving the abdominal symptoms.

Two other cases are also described in which, besides the above symptoms, there were also added attacks of bronchial asthma.

The author points out that those cases confirm the view that the Basedow's symptoms got in tabetics are a result of a lesion of the vago-sympathetic system. In the paper he discusses which part of the system is probably effected as presented by the patient's symptoms.

R. A. KRAUSE.

- ATROPHY OF THE MEDULLA, FILLET, AND SUPERIOR CEREBELLAR PEDUNCLE IN FRIEDREICH'S DISEASE.** (Examen du névraxe dans un cas de maladie de Friedreich: atrophie du bulbe, du ruban de Reil, et du pédoncule cérébelleux supérieur.) THOMAS and DURUPT, *Rev. Neurol.*, Sept. 30, 1912, p. 317.

In a typical case of Friedreich's disease the lesions were by no means so strictly limited to the spinal cord as is usually supposed to be

the case. In certain systems (*e.g.*, the pyramidal) degeneration affects the peripheral ends of the neurones concerned, and does not extend to the trophic centres of these neurones; this is true also of the lower motor neurones (and possibly also of the posterior root neurones, in some cases). In other systems (as in the case here reported) degeneration reaches the trophic centres concerned and the whole system disintegrates: this occurred in the median fillet and its cells of origin, in the nucleus of Monakow, in the direct cerebellar tracts and the columns of Clarke, and in the dentate nuclei and the superior cerebellar peduncles.

S. A. K. WILSON.

**SUB-ACUTE COMBINED DEGENERATION OF THE SPINAL CORD.** LONG, *Rev. Neurol.*, May 15, 1912, p. 585.

A TYPICAL case of this disease, which is considerably less frequent in France, apparently, than in England. According to Long, as yet no case has occurred at the Salpêtrière. An excellent description of the pathology of the reported case is furnished. The author has no new hypothesis of the pathogeny of the condition.

S. A. K. WILSON.

**A FRESH CASE OF TYPHOID SPINE IN THE CHILD.** (*Spondylite typhique, nouveau cas observé chez l'enfant.*) ARDIN-DELTHEIL, M. RAYNAUD, and M. COUDRAY, *Bull et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiii., p. 900.

A BOY, aged 10 years, on the twenty-seventh day of an ordinary attack of typhoid fever, was suddenly seized with severe pain in the lumbar region radiating into the hip and throughout the lower limb. The pain was both constant and paroxysmal. There was also severe pain on pressure of the spines and transverse processes of the third to fifth lumbar vertebræ, and a definite band of hyperæsthesia was found on the inner aspect of the left thigh and leg corresponding to the distribution of the fourth lumbar root. The X-rays showed a slight degree of spondyloarthritis. Apart from marked hypertension and an excess of albumin, the cerebro-spinal fluid was normal. Considerable relief followed lumbar puncture, and in two months from the onset recovery was complete.

J. D. ROLLESTON.

**TWO CASES OF TYPHOID SPINE OBSERVED IN PARIS.** (*Deux cas de spondylite typhique observés à Paris.*) J. AUCLAIR and R. J. WEISSENBAUGH, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 353.

*Case 1.*—Male, aged 19. Onset of symptoms on eighty-eighth day of typhoid fever complicated by two relapses. Complete cure in three months after immobilisation in plaster jacket.

*Case 2.*—Male, aged 15. Onset on fifty-third day of typhoid after temperature had become normal. Immobilisation in plaster jacket and recovery in five months.

The normal condition of the cerebro-spinal fluid in each case negatived the diagnosis of meningitis or myelitis. Skiagrams of the first case were negative, in the second they showed opacity of the normally transparent intervertebral discs between the third and fourth, and fourth and fifth lumbar vertebrae. These three vertebrae appeared to be surrounded by a diffuse organised sheath which involved the ligaments and transverse processes. As the lesions chiefly affected the vertebral articulations the term spondyloarthritis or perispondylitis would be more correct anatomically than spondylitis.

J. D. ROLLESTON.

**TWO FATAL CASES OF NON-MENINGOCOCCAL CEREBRO-SPINAL MENINGITIS CAUSED BY A POLYMORPHOUS COCCUS.** (Deux cas mortels de méningite cérébro-spinale non-méningococcique causés par un coccus polymorphe.) F. CHEVREL and J. BOURDINIÈRE, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 325.

THE patients were a man aged 38, and a girl of 4 months. The organism isolated from the blood and cerebro-spinal fluid was a diplococcus resembling the meningococcus, but of smaller size. In cultures it usually appeared single, but it also formed tetrads. It was constantly associated with a polymorphous bacillus, which was short and thick in young cultures and filamentous in old cultures. It was impossible to determine whether this was a case of symbiosis of two distinct germs or of a single polymorphous organism.

J. D. ROLLESTON.

**CEREBRO-SPINAL MENINGITIS IN AN INFANT OF FIVE MONTHS. PURPURA, MENINGOCOCCAL SEPTICÆMIA, SEROTHERAPY, RECOVERY.** (Méningite cérébro-spinale chez un nourisson de cinq mois. Purpura, Septicémie méningococcique, Sérothérapie, Guérison.) TRIBOULET DEBRÉ and PARAF. *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxiv., p. 552.

THE child was admitted to hospital for febrile purpura. The only meningeal manifestation was slight nuchal rigidity. Meningococci were found in the turbid cerebro-spinal fluid, blood and nasopharynx. It was impossible to say whether the septicæmia preceded the meningitis or *vice versa*.

J. D. ROLLESTON.

**MENINGOCOCCAL SEPTICÆMIA.** (Les méningococcémies (septicémies méningococciques).) S. PORTRET *Thèses de Paris*, 1912-13, No. 41.

PORTRET adopts the following classification with illustrative cases from literature :—



1. Meningococcal septicæmia without meningitis, as in cases reported by Bovaird (*v. Review* 1909, vii., p. 419), Netter (*ibid.* p. 741), Monziols and Loiseleur (*ibid.* 1910, viii., p. 304), and Chevrel and Bourdinière (*ibid.* p. 703).

2. Meningococcal septicæmia followed by cerebro-spinal meningitis, as in cases reported by Pissavy (*ibid.* 1912, x., p. 27), and Lemierre, May, and Portret (*ibid.* p. 486). ;

3. Cerebro-spinal meningitis accompanied by meningococcal septicaemia (a) without metastases; (b) with metastases in the joints as in Vigot's cases (*ibid.* 1911, ix., p. 130), in the lungs, heart (*ibid.* 1912, x. 487), or brain (*ibid.* 1911, ix. 31).

Meningococcal septicæmia must be distinguished from septicæmia due to the parameningococcus. In the treatment intravenous and subcutaneous injections must be associated with intraspinal serotherapy.

J. D. ROLLESTON.

**RECOVERY FROM TUBERCULOUS MENINGITIS. (Ménigite (26) tuberculeux guérie.)** Mlle. E. COTTIN, *Rev. de Méd.*, 1912, xxxii., p. 848.

THE patient was a man, aged 21, suffering from pulmonary tuberculosis, who recovered successively from pneumothorax, meningitis, nephritis and anal abscess, the tuberculous nature of each complication being confirmed by bacteriological and experimental examination. The recovery from meningitis had now been maintained for eight months. He still had occasional headaches, neuralgic in character, and his sputum still tuberculised guinea-pigs, but his general condition was excellent, and he had gained 18 kilos in six months.

J. D. ROLLESTON.

**VERY EARLY ACUTE SYPHILITIC MENINGITIS. (Ménigite (27) aiguë syphilitique très précôce.)** C. ACHARD and G. DESBOUIS, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 559.

A WOMAN, aged 20, who had had a vulvar chancre two months previously, was admitted to hospital with meningitis. Rapid improvement followed injections of biniodide of mercury. On re-admission some months later with cutaneous syphilides and mucous tubercles intra-muscular injections of neo-salvarsan were given, of which she received seven in eight weeks. The syphilides healed rapidly, and the meningeal lymphocytosis was reduced from fifty to three or six lymphocytes per c. mm. Wassermann's reaction was still positive with the blood serum and doubtful in the cerebro-spinal fluid.

J. D. ROLLESTON.

**ACUTE AND SUBACUTE SECONDARY SYPHILITIC MENIN-**

(28) **GITIS.** (*Méningites syphilitiques aiguës et subaiguës de la période secondaire.*) L. JEANSELME, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 657.

**A RECORD of two cases.**

*Case 1.* A woman, aged 22, who had had syphilis for three years, and had had only a few months' treatment, suddenly developed acute meningitis, characterised by severe headache, followed by delirium and coma, generalised rigidity, Kernig's sign, facial paralysis, and strabismus. Staining left by the roseola was still present. The cerebro-spinal fluid showed a large quantity of albumin, and a leucocytosis in which the lymphocytes predominated. Wassermann's reaction was well marked in the cerebro-spinal fluid, but very slight in the blood serum. Some improvement in the symptoms followed two intravenous injections of "606," and the leucocytosis diminished, but the albumin content still remained high, and Wassermann's reaction continued positive. Facial erysipelas and broncho-pneumonia ensued, and death took place.

*Case 2.* A woman, aged 21, six months pregnant, and presenting a well-marked roseola and mucous tubercles, developed a severe headache which was not relieved by aspirin. The cerebro-spinal fluid showed lymphocytosis and excess of albumin. Wassermann's reaction was positive in the blood, but negative in the cerebro-spinal fluid, as is the rule when the meningeal reaction is not very intense. The headache disappeared immediately after the first injection of "606," but the cerebro-spinal fluid had not become completely normal after six injections. An apparently healthy child was born at full term.

J. D. ROLLESTON.

**ON MENINGITIS DUE TO HÆMOPHILIC ORGANISMS — SO-**

(29) **CALLED INFLUENZAL MENINGITIS.** HERBERT HENRY, *Journ. Pathol. and Bact.*, Vol. xvii., No. 2, Oct., p. 174.

AUTHOR gives nine cases in which influenza-like organisms were found microscopically, and in most of them cultivated on hæmoglobin media. Six of these cases are described with some detail, and the post-mortem findings given.

As regards the clinical features of the cases, all six were in children under 6 years of age, three gave a history of discharge from the ear. For the rest the symptoms appear to have been those of an acute meningitis.

The post-mortem findings in five cases were those of widespread purulent cerebro-spinal meningitis. In one case the inflammatory process was localised to one hemisphere. In addition to the

meningeal inflammation the ventricles were found distended with purulent fluid. The appearances, in fact, were very similar to what is found in cases of pneumococcal meningitis.

In the fresh cerebro-spinal fluid the organisms were found in large numbers within the leucocytes. The organisms were, as a rule, small, although occasional filamentous forms were met with. The filamentous forms were much more numerous in cultures.

The various strains of the organism grew only at body temperature, and only on hæmoglobin-containing media. The colonies showed the usual characters of those of the influenza bacillus.

As regards pathogenicity, great variations were found in the various strains, some producing little effect on rabbits, others causing septicæmia.

JAMES MILLER.

**POST - TRAUMATIC SYNDROME RESEMBLING GENERAL (30) PARALYSIS CAUSED BY AN ACUTE MENINGITIS OF SLOW EVOLUTION.** (*Syndrome paralytique post-traumatique déterminé par une méningite aigüe à évolution lente.*) RAYNEAU and MARCHAND, *Rev. Neurol.*, April 30, 1912, p. 529.

A HEALTHY man of 35, with no history of any previous illness, met with a very severe accident at a level crossing, and after a period of unconsciousness gradually developed mental symptoms bearing a close resemblance to general paralysis. In addition, the pupils were subsequently found to be unequal, but their reflexes were normal. The lower left face was slightly weak: articulation was occasionally defective. The patient died in an asylum twenty months after the accident, a diagnosis of traumatic general paralysis having been made. At the necropsy, however, the appearances were solely those of acute meningitis of a purulent nature, and microscopical examination showed that it had been of slow evolution, and had spread backward from the frontal poles. None of the histological features of general paralysis were found. A case of this sort indicates the desirability of caution in diagnosing traumatic general paralysis, unless the characteristic histological appearances of that condition are subsequently found.

S. A. K. WILSON

**AN ANALYSIS OF 123 CONSECUTIVE CASES IN WHICH OPERA-**  
**(31) TIONS WERE PERFORMED FOR THE RELIEF OF THE**  
**MASTOID, LABYRINTHINE AND INTRACRANIAL COM-**  
**PLICATIONS OF SUPPURATIVE OTITIS MEDIA.** G. S. FRASER and J. K. MILNE DICKIE, *Journ. Laryngol. Rhinol. and Otol.*, Vol. xxvii., No. 3, 1912.

THE series is divided into four groups—

A. 32 acute cases in which the Schwartze operation was

performed: in 6 of these cases the radical operation was completed later on, while in 1 the modified radical operation was performed. 5 cases proved fatal. 3 had meningitis, in 2 combined with labyrinthitis, 1 died of septicæmia, one death under an anæsthetic (a diabetic case).

**B. 78 chronic cases—**

- (1) In 11 the modified radical operation was performed.
- (2) In 52 the radical operation.
- (3) 4 cases of successful operation on the labyrinth.
- (4) 2 cases of successful operation for venous thrombosis.
- (5) 9 fatal cases (4 of purulent meningitis, combined with labyrinthitis in 3); 1 from meningitis and sinus thrombosis; 1 from sinus thrombosis and pyæmia; 1 from tempero-sphenoidal abscess, labyrinthitis and meningitis; 1 from cerebellar abscess with early meningitis; 1 from status lymphaticus—acute sepsis.

**C. 12 tubercular cases:** 1 death from miliary tuberculosis.

**D. 1 malignant case.**

R. VÉREL

**BULLET WOUND OF THE SPINAL CORD BETWEEN THE FIRST  
(32) AND SECOND DORSAL VERTEBRÆ: LAMINECTOMY:  
REMOVAL OF THE BULLET: COMPLETE RECOVERY.**

WILLIAM B. COLEY, *Annals of Surgery*, Vol. lvi., No. 1, 1912, p. 60.

THE author recounts the history of a girl, 14 years old, who was shot in the back with a bullet .22 calibre: the missile entered the spine in the middle line between the first and second dorsal vertebrae. The girl immediately lost control of the lower extremities. An hour later there was complete paralysis of both legs, paralysis of both sphincters, mobility of both arms good, but movement of the right arm caused intense pain.

An X-ray photograph showed the bullet in three fragments lodged between the first and second dorsal vertebrae: the vertebrae were not fractured, and whether the spinal cord had been pierced or not it was impossible to say. An operation was performed twenty-four hours after the accident: the bullet wound was traced and enlarged.

The right lamina was found to have been perforated, and two fragments of the bullet were actually removed from the substance of the spinal cord. No attempt was made to close the dura, and the wound was drained. There was a free discharge of cerebro-spinal fluid for ten days, and then it ceased.

The patient made a continuous recovery, and at the end of two months was perfectly well except for a slight limp in the left leg. The author reviews results of similar cases published by Pilcher, Winslow, Fort, and others. He draws attention to the important experimental work at present being done by Allen of Philadelphia.

Allen has shown that severe concussion of the spine results in widespread paralytic symptoms, and yet he has succeeded in preventing and curing these symptoms by making a longitudinal incision into the cord immediately after the concussion was obtained: in other words by establishing drainage.

J. FRASER.

**CASE OF MOLLUSCUM FIBROSUM WITH DEFINITE FAMILY HISTORY.** H. B. STEEN, *Ind. Med. Gaz.*, 1912, xlvii., p. 400.

A RECORD of a case in a Hindu boy, aged 12, whose grandmother, father, uncle, and sister were similarly affected. Allusion is made to Scott's case (*v. Review*, 1912, x., p. 31). J. D. ROLLESTON.

**A CASE OF VON RECKLINGHAUSEN'S DISEASE.** M. S. ROSENTHAL, (34) *Amer. Journ. Derm.*, 1912, xvi., p. 603.

THE patient was a negro with no family history of tumours and no serious previous illnesses. No other abnormalities. Intelligence above the average for a negro. The tumours were of two varieties: (a) pedunculated, freely movable in all directions, with the overlying skin not adherent, (b) but slightly movable and firmly attached to the deeper structures.

Biopsy of (a) showed them to be fibromata. A few nerve fibrils were found in (b). There was no involvement of any of the large nerve trunks. Owing to his colour alteration in pigment was not obvious. J. D. ROLLESTON.

**THE ARGYLL-ROBERTSON PUPIL IN NON-SYPHILITIC AFFECTIONS.** (Le signe d'Argyll-Robertson dans les affections non syphilitiques.) FELIX ROSE, *Semaine Medicale*, No. 49, Dec. 4, 1912.

THIS is a critical review dealing with recent literature on the subject. The conclusions come to are those generally held. In the immense majority of cases the presence of an Argyll-Robertson pupil means the existence of an old syphilitic infection, and this is practically always so when the Argyll-Robertson pupil is the only sign of nervous system disease present. In syphilitic affections, it occurs much more often in parasyphilitic or quaternary lesions than in tertiary or in secondary. The condition, however, has been reported in some, though very few, cases of undoubted non-syphilitic affections such as some traumatic cases, some cases of alcoholism (*v. Review*, 1912, x. 455), one case of diabetes, one case of disseminated sclerosis, and some cases of syringomyelia.

The pathology of the condition is discussed briefly, and the

arguments in favour of a variable location for the lesion responsible for it.

A useful bibliography of recent literature is given.

P. W. SAUNDERS.

**HEMIPLEGIA IN THE EARLY STAGE OF SYPHILIS.** (Hemiplegie (36) im Frühstadium der Syphilis.) B. SCHLÜCHTERER, *Münch. med. Woch.*, 1912, lix., p. 2395.

A MARRIED woman, aged 21, developed typical right hemiplegia six months after infection in addition to malignant syphilis.

Mercurial treatment was of no avail, but rapid improvement followed injections of salvarsan, combined with small doses of mercury and potassium iodide. The hemiplegia was probably due to endarteritic thrombosis in the internal capsule.

J. D. ROLLESTON.

**FEVER IN THE LATE STAGE OF SYPHILIS.** (Zur Frage des (37) Fiebers in späten Syphilisstadien.) BJALOKUR, *Wien. Klin. Woch.*, 1912, xxv., S. 1490.

THE patient was a man, aged 53, who had led a dissolute life, but denied syphilitic infection. For the last fifteen years he had suffered on and off from fever, diarrhoea, sweating, and occasional hæmoptysis. The liver and spleen were slightly enlarged. The diagnosis oscillated between malaria and tuberculosis, but treatment appropriate to these diseases was of no avail. That syphilis was not suspected is shown by the fact that it was not until six years after the introduction of Wassermann's reaction that this test was applied. A positive result was obtained. Potassium iodide was exhibited combined with injections of sodium cacodylate, and a rapid disappearance of the symptoms ensued.

J. D. ROLLESTON.

**THE ACHILLES JERK AND REFLEX OF THE TENSOR FASCIAE (38) FEMORIS IN SCIATICA FROM DISEASE OF THE NERVE ROOT AND FROM DISEASE OF THE NERVE TRUNK.** (Les réflexes du tendon d'Achille et du tenseur du fascia lata dans la sciatique radiculaire et dans la sciatique tronculaire.) BONOLA, *Rev. Neurol.*, September 30th, 1912, p. 324.

In patients suffering from sciatica, with alterations in the reflexes of the lower extremity, absence or diminution of the Achilles jerk and of the reflex of the fascia lata is a sign that the sciatica is of root origin: absence or diminution of the former with conservation of the latter indicates that the trunk of the nerve is effected.

S. A. K. WILSON.

- DELAYED TEMPORARY PARALYSIS OF THE SIXTH CRANIAL NERVE IN FRACTURES OF THE SKULL.** (Paralysies tardives et passagères du moteur oculaire externe dans les fractures du crâne.) A. BROCA and B. DESPLAS, *Rev. de Chir.*, Tome xlvi, No. 9, Sept. 1912, p. 349.

THE authors discuss the frequency with which paralysis of the sixth cranial nerve occurs in fracture of the skull, and they point out that frequently it may be the only existing symptom suggestive of fracture.

The paralysis may arise from various causes—an actual rupture of the nerve; pressure from resulting callus, and the sudden pressure of effused blood.

Details of two cases are discussed, in which the paralysis occurred in children secondary to fracture of the base: the paralysis came on late and gradually disappeared. In one instance the sixth nerve alone was involved; in the other both the sixth nerve and the seventh were affected.

The condition may appear within three or four days of the accident and within a week may have cleared up. In other instances the recovery may not be complete until five to six months after the injury.

The distinctive late development of the paralysis has a certain anatomical bearing. The sixth nerve lies in intimate relationship to the apex of the petrous portion of the temporal bone. About 2 mm. from this apex there is fixed to the upper border of the petrous bone "Gruber's Ligament," a fibrous band springing from the posterior wall of the cavernous sinus.

The nerve passes beneath this ligament lying upon the bone, below the inferior petrosal sinus.

In such a fixed position it is liable to compression, and it is probable that the characteristic late paralysis is the result of a hæmatoma produced around the nerve or actually in its sheath.

J. FRASER.

- OBSERVATIONS ON THE PATHOLOGY OF TEMPORARY FACIAL PARALYSIS, SECONDARY TO FRACTURES OF THE PETROUS PORTION OF THE TEMPORAL BONE.** (Note sur la pathogénée de la paralysie faciale secondaire et temporaire dans les fractures du rocher.) H. NIMIER and A. NIMIER, *Rev. de Chir.*, No. 7, July 1912, p. 1.

THE paper is introduced by an epitome of the various theories which are held regarding the etiology of such facial paralysis. Three such theories are mentioned. (1) The compression of the nerve in the aqueduct of Fallopius by effused blood (Vialle, Alt, Voran). (2) The compression of callus resulting in the process of fracture repair (Demoulin). (3) A post-traumatic otitis (S. Duplay).

The last of these is at once ruled out of count: it is due to the lighting up of a pre-existing inflammation, and therefore not strictly the result of the fracture.

The authors consider the second theory is weakened by two objections, the date at which the resulting callus would begin to appear, and the fact that the distinctive point in fractures of the skull is the very small amount of external callus which arises.

They reject the hypothesis that the simple effusion of blood produces the paralysis, because it has not been verified by post-mortem examination.

The view which the authors support is that the paralysis results from a condition of multiple points of hæmorrhage actually into the nerve substance: little patches of ecchymosis which actually rupture the nerve filaments, or by pressure destroy their power of conduction.

The recovery of such a facial paralysis, perhaps after many months, is the outcome of a true nerve regeneration.

Their conclusions are summed up with the following words: "Judging from post-mortem appearances, we believe that temporary, secondary facial paralysis arising as a complication of fracture of the petrous portion of the temporal bone, is the result of a temporary disorganisation of the nerve trunk by blood effused into the nerve substance as a result of the injury."

J. FRASER.

**TUMOUR OF THE CEREBELLO-PONTINE ANGLE.** (*Tumeur de (41) l'angle ponto-cérébelleux.*) GEERTS, *Journ. de Neurol.*, Ann. 17, No. 21, Nov. 5, 1912, p. 409.

A WELL-DEFINED case of cerebello-pontine tumour with abundance of classical symptoms. In addition to general symptoms of compression there were localising signs which rendered a very exact diagnosis possible. Tinnitus was present, accompanied by an increasing deafness. Both the cochlear and vestibular roots of the eighth nerve were affected. The seventh, fifth, fourth, ninth, and tenth nerves were all involved to a slight extent. Cerebellar symptoms and evidence of pressure on the motor tracts completed the clinical picture. A decompression operation was performed, followed later by an unsuccessful attempt at removal. The post-mortem revealed a glioma in the left cerebello-pontine angle.

W. BOYD.

**DECOMPRESSION CRANIECTOMY.** (*La craniectomie décompressive.*) E. BOUCHÉ, *Journ. de Neurol.*, Ann. 17, No. 18-20, Aug.-Oct. 1912, p. 301.

THIS is an extremely full discussion of the question of decompression from the physiological, pathological, and operative standpoints;



so full, indeed, as to make the task of abstraction impossible. Special attention is paid to optic neuritis, and to the question of the best operation, that favoured by the author being the sub-temporal operation of Cushing. One of the features of the paper is a most exhaustive bibliography.

W. BOYD.

**A CASE OF ACROMEGALY WITH MENTAL SYMPTOMS.** E. R. (43) EAST, *Journ. Ment. Sc.*, Vol. lviii., Nos. 2 and 3, Oct. 1912, p. 631.

A TYPICAL case of acromegaly, but without definite signs of pituitary enlargement, such as hemianopia. A very full list of measurements of the head, arms, and legs is given. The mental state was one of acute excitement with confusion and hallucinations.

W. BOYD.

**EXOPHTHALMIC GOITRE WITH GENERALISED PIGMENTATION.** (44) TION. (Goitre exophtalmique avec pigmentation généralisée). A. SIREDEY and Mlle. DE JONG, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 321.

THE patient was a woman, aged 65, whose condition was attributed to a polyglandular syndrome involving both the thyroid and suprarenals. This hypothesis was all the more probable as she had previously shown evidence of ovarian insufficiency, viz., late onset of puberty (at 20) and painful and scanty menstruation.

J. D. ROLLESTON.

**SYMMETRICAL HYPERTROPHY OF THE SALIVARY GLANDS** (45) IN A CRETIN. (Sur un cas d'hypertrophie symétrique des glandes salivaires chez un crétin.) C. PARHON and C. URECHIA, *Journ. de Neurol.*, Ann. 17, No. 20, Oct. 20, 1912, p. 381.

THE patient, a man of 40, presented marked hypertrophy of the parotid glands on both sides. The other salivary glands were not enlarged, nor were the lachrymal glands. The thyroid was moderately enlarged. The mononuclear elements of the blood were increased. A lack of mental development was very evident. The case, therefore, comes into the category of the syndrome of Mickulicz. A full discussion is given of the cases of this condition already described in the literature, together with a very complete bibliography.

W. BOYD.

**TETANY FOLLOWING EXTIRPATION OF THE THYROID.** (46) FRANCIS J. SHEPHERD, *Annals of Surgery*, Vol. lvi., No. 5, 1912, p. 665.

BEFORE the function of the parathyroid glands was known, Reverden and Kocher noticed that symptoms of tetany followed

the complete removal of the thyroid gland, but that if a part of the gland was left, the patient as a rule escaped tetany and also cachexia strumipriva.

Gley in 1891-1897 proved for the first time by experiments on animals that post-operative tetany was due to the removal of the parathyroids and not to the thyroid.

Now there are two theories of the functions of the parathyroids: (1) That an antitoxin is developed by the parathyroids which neutralises certain waste products of tissue metabolism (Berkeley), so that when the parathyroids are destroyed, a toxic material is formed in the blood which causes tetany. (2) That the calcium metabolism of the cells of the body is controlled by the parathyroids, and that their removal causes a rapid disappearance of the soluble salts of calcium from the blood (MacCallum).

Based upon this latter theory is the treatment of tetany by the administration of calcium lactate.

The author describes his experiences in dealing with a case of tetany which developed after the operation of thyroidectomy. The patient was a woman, 34 years of age, suffering from a large cystic goitre; the dyspnoea and dysphagia were so marked that operation was recommended. The operation was a difficult one: with the exception of a small piece of the lower pole, the whole gland was removed and with it, presumably, the parathyroid.

Symptoms of tetany developed three days after operation; they took the form of dizziness, numbness, formication, and pain at the bases of both lungs.

Upon the fifth day these symptoms were complicated by cramps in both hands, and severe paroxysms in both arms and legs; the thumbs were contracted in the palms of the hands, the fingers flexed at the metacarpo-phalangeal joint, the wrist flexed and elbows bent. The toes were flexed and adducted, and the feet extended. Chvostik's sign was well marked and pressure upon a nerve trunk produced spasms (Trousseau's sign).

Treatment was begun with the appearance of severe symptoms (fifth day), and consisted in drachm doses of lactate of calcium every three hours. Two administrations of the drug caused a disappearance of symptoms; five administrations were given. Two days later symptoms recurred and were again relieved by the drug. The patient exhibited an extreme dislike to calcium lactate, but the substitution of parathyroid extract produced no alleviation of symptoms. The patient left hospital upon the twenty-first day, and she was then taking 30 gr. of calcium lactate and  $\frac{1}{20}$  gr. parathyroid extract every four hours. At the time of writing the patient was perfectly well, and the administration of calcium lactate had been diminished to 20 gr. twice a day.

The case is cited as agreeing with the etiological theory propounded by MacCallum.

The author draws attention to the difficulty there is in recognising parathyroid tissue during operation. J. FRASER.

**A CASE OF DYSPITUITARISM.** GERHARDT VON BONIN, *Quart. (47) Journ. Med.*, Vol. 6, No. 22, Jan. 1913, p. 125.

THERE are hardly any cases of pure hyperpituitarism or of pure hypopituitarism, but both types are generally mixed. Sexual infantilism and adiposity are symptoms of hypopituitarism, and are generally, if not always, found associated with acromegaly, *i.e.*, hyperpituitarism. This would be accounted for by Cushing's theory that one secretion enters the blood directly, whilst the way for the other to the third ventricle is blocked by the pressure from the tumour upon the infundibulum. The changes in the histological appearance of the thyroid in cases of acromegaly are probably due to the same physiological fact: a lower demand for the thyroid products on the part of the body-cells. The changes in the thyroid and in the testicles are due to a primary state of hypopituitarism. The growth-changes in acromegaly are not confined to particular parts of the body, but occur in all parts of the skeleton. These growth-changes are, according to Keith, explained by the assumption that the secretion of the pituitary body acts as a hormone, which renders the osteoblasts more sensitive to mechanical and other stimuli. A. NINIAN BRUCE.

**A CASE OF HYPOPHYSO-GENITAL SYNDROME DUE TO (48) SYPHILIS.** (Syndrome hypophyso-génital d'origine syphilitique.) P. CARNOT and J. DUMONT, *Bull. et Mém. d. l. Soc. Méd. des Hôp. de Paris*, No. 31, Nov. 14, 1912, p. 430.

THE patient shown was a man of 36. A syphilitic chancre at 18, followed by secondaries. At 21 malaria. At 24 vague, fleeting pains in lower extremities, with rather marked thirst, and some polyuria which has persisted for these twelve years. At 29 violent cephalalgia with rapid onset of bilateral blindness: vision improved greatly under specific treatment: meanwhile, he had nocturnal delirium, wandered, and was violent: he went into hospital, and came out asthenic. At this time (7 years ago) rapid loss of hair of beard, pubes, and axillæ, with testicular atrophy and impotence: abdomen swollen, of female type. Examination now shows only moderate fatness; a pelvis large, of female type; no giantism or enlargement of extremities; face eunuchoid, pale, waxy, wrinkled; eye-lashes and scalp-hair preserved; no marked loss of extremity of eyebrows (Hertoghe's sign of hypothy-

roidism). Testes reduced to soft, insensitive, smooth masses the size of haricot beans; epididymis and cord atrophied; penis small; prostate not obviously altered. Psychically, apathetic, calm, mild, no volitional energy; intelligence feeble; speech drawling. Vision now not bad. Considerable chilliness; extreme asthenia; no skin pigmentation. Thyroid not palpable. Slight polyuria and polydipsia, but no glycosuria or albuminuria. A lateral skull radiogram shows (1) slight enlargement of posterior clinoid processes; (2) none of sella; (3) great enlargement of frontal, maxillary, and sphenoidal sinuses; (4) great thickening of cranial bones, especially occipital. The writers interpret their case as one of a syphilitic lesion in the neighbourhood of the hypophysis, causing secondarily testicular atrophy with signs of eunuchoidism. They discuss the question of a slight hypothyroidism, but acquit the adrenals.

LEONARD J. KIDD.

**NOTES ON A CASE OF PRECOCIOS DEVELOPMENT IN A**  
**(49) BOY AGED 6 YEARS.** E. C. WILLIAMS, *Brit. Journ. Child.*  
*Dis.*, 1912, ix., p. 529.

THE boy had begun to develop rapidly about six months before admission, when his condition was as follows: weight 4 st. 2 lbs., height 4 ft. 2 in. Slight moustache, voice deep, like an adult's. Abundance of pubic hair; no axillary hair. External genitals well developed. Intelligence and movement slow.

A skiagram of the skull showed that the pituitary fossa was enlarged in the antero-posterior direction. The length of the cranium was 90 mm., and the greatest breadth 145 mm. The advanced condition of ossification in the hands corresponded to that of a boy of 14 or 16 years.

There was no evidence of adrenal hypernephroma, which has been found in many cases of sexual precocity, but Williams suggests that the relatively high blood-pressure—110 mm.—was due to an excess of suprarenal or pituitary extract in the blood.

J. D. ROLLESTON.

**THE MECHANISM OF PITUITARY GLYCOSURIA.** (*Le mécanisme*  
**(50) de la glycosurie hypophysaire.**) H. CLAUDE and A. BAUDOUIN,  
*Compt. Rend. Soc. de Biol.*, lxxiii., No. 34, Dec. 6, 1912, p. 568.

THE writers showed in the same journal (lxxii., No. 20, June 7, 1912, p. 855) that in man this is an alimentary glycosuria: they never obtained it in the fasting state, but only when, some minutes after hypodermic injection of pituitary extract, a meal of milk, bread, and sugar was taken, representing 140 to 150 g. of glucose. They never got the glycosuria with anterior lobe extract, not even

in those patients who reacted to posterior lobe extracts. This reaction was chiefly marked in arthritic and "pre-diabetic" patients, and little or not at all in others. The extracts were made from either the posterior lobe or from the whole gland of the ox: the lipoids were removed from the extract by chloroform in a Soxhlet's apparatus. In the present paper the writers record four experiments on an arthritic man of 45 who passed traces of sugar after a meal rich in carbohydrates: the test meal consisted of 90 g. of glucose dissolved in 2 litres of water, 100 g. of bread, and a little meat. They find that the glycosuria varies according to the relation of the time of the injection and the meal. To obtain the maximum glycosuria, the sugar must be taken from half an hour to one hour after the injection of pituitary extract: the effect of the injection tends to become exhausted, but it lasts for several hours and may last till the next day. But the reaction appears also when the meal is taken 3, 4, or 6 hours after the injection, but the glycosuria becomes progressively smaller. If, however, the meal be taken  $2\frac{1}{2}$  or 3 hours before the injection, it usually happens that no glycosuria follows: in any case it is infinitely less than by the former plan; and, if it does so occur, it is only one or two hours after the injection: it seems then that the injection needs a certain time to give its effects. The most probable explanation of pituitary glycosuria is held to be that the pituitary extract determines an hepatic insufficiency, so that there is a failure of fixation of glucose in the state of glycogen. As to whether this is caused by a direct action on the liver or by the nervous system, the writers point out that the question should be solved by showing whether pituitary glycosuria occurs after section of the splanchnic nerves. They think the action of the nervous system is probable, on account of the analogy with adrenalin glycosuria. They hope to show in an early paper that, in man, pituitary extracts act exactly like those of the adrenals, in the same subjects and according to the same laws. They claim that pituitrin (as much, or even more than adrenalin), stimulates the sympathetic; and all its general effects, malaise, pallor of skin, and contraction of unstriated muscle, are very well explained by excitation of the sympathetic system.

LEONARD J. KIDD.

## PSYCHIATRY.

**AN ADDRESS ON MENTAL DISORDERS.** Sir E. H. SAVAGE,  
(51) *Lancet*, Vol. clxxxiii., Oct. 26, 1912, p. 1134.

THIS is the Presidential Address delivered before the new Section of Psychiatry of the Royal Society of Medicine. The President first gives a review of the progress of psychiatry in England, and

then goes on to point out some of the principal problems awaiting solution at present. He dwells on the complex but vitally important subject of bodily and mental relationships, and mentions some interesting and perplexing cases which he has encountered in practice. Considerable space is devoted to the question of heredity, and the transmission of a tendency to mental disorder, and the address concludes with a reference to internal secretions and the central nervous system, a subject of which the possibilities are boundless.

W. BOYD.

**GYNECOLOGIC DISEASE IN THE INSANE, and its Relation-**  
(52) **ship to the Various Forms of Psychosis.** F. J. TAUSSIG, *Journ. Amer. Med. Assoc.*, Vol. lix., No. 9, Aug. 31, 1912, p. 713.

THE author has examined 537 out of about 900 inmates of the St Louis City Sanitarium, and found 252 to have some lesion in the pelvic organs sufficient to cause symptoms at present or in the future. These lesions are recorded: 87 suffered from retroversion and 52 from a relaxed pelvic floor. It seems probable that gynecological disease is only slightly more common in insane women than in the sane.

In senile dementia, terminal dementia, and paranoia, only about one-third was diseased, in dementia præcox about one-half; among the imbeciles about two-thirds. In the manic depressive group about 74 per cent. showed gynecological lesions, and a large proportion of these showed a chronic inflammatory condition of the genital tract. The number of recoveries from this form of insanity after gynecological operations is so large that when a definite lesion is found it should always be corrected by local or operative measures.

A. NINIAN BRUCE.

**DEMENTIA PRÆCOX FRUSTE WITH DYSPRAXIA** (Démence  
(53) **précoce fruste avec phénomènes de dyspraxie.**) MABILLE, *Rev. Neurol.*, June 15, 1912, p. 238.

THE case described is peculiarly interesting, and somewhat difficult to class. It is also debateable whether the symptoms described are really those of dyspraxia as commonly understood. The patient, an intelligent student, aged 30, presents the following symptoms: he is unable to perform any act to order until an interval of from 20 to 60 seconds has elapsed; as a result, he takes an unconscionable time in dressing himself, in eating, &c. Such an action as lighting a cigarette is correctly performed, but there are long pauses between the constituent elements in the action, each of which, nevertheless, is performed rather suddenly and

abruptly. There are numerous other examples of this aboulia quoted, and a discussion of the diagnosis is appended.

S. A. K. WILSON.

**DEMENTIA PRÆCOX IN RELATION TO APRAXIA.** ROBERT JONES, (54) *Journ. Ment. Sc.*, Vol. lviii., Nos. 2 and 3, Oct. 1912, p. 597.

THE text of this paper was a case described in the Presidential Address delivered to the Congress of French-speaking Alienists at Tunis in April 1912. The case was that of a student, æt. 30, who suffered from an affection of the will. Recent memory was bad, power of attention and of concentration were feeble, but it was in the domain of action that there was the most marked defect. Although not paralysed in any way, the patient was unable to carry out the simplest movements until after an interval varying from a few minutes to several hours. The case was not one of true apraxia, but rather "apraxia by suspension," or ideational inertia, seeing that in the end the movement could be produced. In addition to the apraxia there were apathy, loss of intellectual activity, retarded mental reaction, and inadequate emotional tone, all of which point towards a diagnosis of dementia præcox. The relation of this disease to apraxia is discussed, and a summary given of the most recent views regarding the morbid anatomy of the two conditions.

W. BOYD.

**APPENDICITIS IN PRIVATE AND PUBLIC HOSPITALS FOR THE INSANE.** J. F. BRISEVE, *Journ. Ment. Sc.*, Vol. lviii., Nos. 2 and 3, Oct. 1912, p. 622.

THE fact is brought out that appendicitis is a very rare disease amongst the insane. In 2000 post-mortems at Claybury Asylum, there was only one case of appendicitis. The writer maintains that this is due to the routine administration of purgatives to asylum patients, thus preventing any faecal accumulation in the cæcum.

W. BOYD.

**THE SYPHILITIC PSYCHOSES.** F. M. BARNES, *Med. Record*, 1912, ii., (56) p. 591.

BARNES emphasises the following points: (1) There is no mental symptom-complex characteristic of syphilitic disease of the nervous system. (2) Many types of psychoses may be simulated by mental disorders caused by syphilis. (3) Cerebral syphilis may develop in a brain already affected with mental disorder, and may occur in conjunction with organic disease of the brain. (4) Paralysis,

paresis and convulsive episodes may be absent when mental disturbance is due to syphilis. (5) The diagnosis during life is frequently difficult and often impossible.

J. D. ROLLESTON.

## TREATMENT.

### PROGRESS IN THE TREATMENT OF THE NEUROSES. E. W.

(57) TAYLOR, *Boston Med. and Surg. Journ.*, Vol. clxvii., No. 9, Aug. 1912.

IN this paper the author shows in a general way the necessity for a fuller and more accurate appreciation of the neurasthenic state by the general practitioner. He points out the importance of a psycho-analysis in such cases as a basis of rational treatment. This view is being brought about, firstly, by the workers in the various fields of psychology, and secondly, by medical men benefiting from such knowledge, and endeavouring by individualistic analysis and explanation to develop the patient's capacity for meeting his personal problem.

A. FERGUS HEWAT.

### THE ACTION OF LARGE DOSES OF SODIUM BICARBONATE

(58) IN DIABETES MELLITIS. (Über einige Wirkungen grosser Dosen Natrium Bicarb. bei Diabetes Mellitus.) OLAV HANSEN, *Zeit. f. Klin. Med.*, Bd. 76, H. 3-4, S. 219.

IN diabetic coma the administration of large quantities of sod. bicarbonate, although of temporary benefit in some cases, caused in a number of other cases tonic and clonic convulsions. The pathological examinations showed that the cases treated with sod. bicarb. had marked hyperæmia and œdema of the leptomeninges, a few of the cases also had hæmorrhages.

R. A. KRAUSE.

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## BOOKS AND PAMPHLETS RECEIVED.

Clark, L. Pierce. "Remarks upon psychogenetic convulsions and genuine epilepsy" (*Med. Record*, Oct. 5, 1912).

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# Review of Neurology and Psychiatry

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## Original Articles

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### THE PINEAL BODY: A REVIEW.

By LEONARD J. KIDD, M.D.

*Introduction ; 1. Ancient Views of the Pineal Body ; 2. Comparative Anatomy and Development ; 3. Comparative Histology ; 4. Clinico-Pathological ; 5. Experimental ; 6. General Discussion ; 7. Conclusions ; 8. References.*

(Continued from page 21.)

#### 5. EXPERIMENTAL.

##### (1) *Extract-Injection Method.*

[I shall make use here of the term "pinealine"—which I have coined—to denote an extract made from the pineal body.]

W. H. HOWELL<sup>73</sup> (1898), in the course of a study of the physiological effects of injection of extracts of the sheep's hypophysis and infundibular body on dogs, found that glycerine extracts of pineal body (probably of sheep, but the source of the pinealine is not stated) gave inconstant results on blood-pressure, viz., sometimes a very slight fall, or none, at others a marked fall. Unfortunately he did not pursue his pineal experimentation any further.

E. VON CYON<sup>74</sup> (1903) found that intravenous injection into rabbits of pinealine of the ox and the sheep had no effect on blood-pressure ; small doses gave a feeble and frequent pulse : large doses

a bigeminal or trigeminal pulse, which disappeared after section of the vagi. He attributed the effects to the presence of salts in the epiphysis, especially phosphate of calcium.

DIXON AND HALLIBURTON<sup>76</sup> (1909) found that sheep's pinealine—prepared in four distinct ways—when injected intravenously into cats, fully anæsthetised with urethane, gave a slight fall of blood pressure, which was transient: chemical examination showed that it was not choline which caused this fall. They concluded that other physiological methods must be employed for the purpose of deciding whether the mammalian pineal has any function.

In 1910 these two authors,<sup>76</sup> experimenting on dogs, anæsthetised with urethane and morphine, found that, while extracts made from the choroid plexuses of ox, sheep, and man, injected into the sub-cerebellar cisterna, or the lumbar region, cause a flow of cerebro-spinal fluid, pinealine has no such effect.

OTT AND SCOTT<sup>76</sup> (1910-1911) reported at a meeting of the Society of Experimental Biology and Medicine, New York, in December 1910 (their full paper appeared in October 1911) that intravenous injection of boiled pinealine (source not stated) had a rapid galactagogue effect on lactating goats. Five grains of pinealine were needed for this effect: one-grain doses had no such effect. No etherisation was used, and the method of Rohrig was applied in these experiments. They got galactagogue effects also with thymus extract (1 gr.), corpus luteum extract (10 grs.), and infundibulin. The galactagogue effect of pinealine was less than that of infundibulin.

In April 1912 these two authors<sup>76</sup> added several new points on the effects of intravenous injection of pinealine and of corpus luteum extracts. The effects of both on the circulation were nearly identical, viz., initial depression of blood-pressure, followed by a rise above normal for a short time: the pulse-rate was not appreciably altered. While corpus luteum had no effect on the kidneys, pinealine caused diuresis and increase of kidney volume due to vaso-dilatation. Application of pinealine to a uterine strip of the rabbit *in situ* caused increased contraction of the pregnant uterus but not of the non-pregnant, whereas corpus luteum extract caused both, but only slight in the case of the non-pregnant uterus. On an excised strip of rabbit's intestine, pinealine gave slight increase of contractions, while corpus luteum gave greatly increased contractions. Finally, in rabbits whose superior cervical sym-

pathetic ganglion had been excised, local application of pinealine gave slight pupillo-dilatation.

In May 1912<sup>76</sup> Ott and Scott reported that a preliminary intravenous injection of gr.  $\frac{1}{16}$  of atropine lessens the galactagogue effects of a subsequent injection of pinealine, corpus luteum extract, and infundibulin. They add that pinealine dilates the renal vessels; and they suggest that, as pinealine, corpus luteum extract, thymus extract, and infundibulin are vaso-dilators in the male genitalia, it is probable that they are also vaso-dilators in the mammary gland.

JORDAN AND EYSTER<sup>77</sup> (1911).

[I have placed their names before those of Schäfer and K. Mackenzie, for though their full paper did not appear till December 1911 (*i.e.*, after that of S. and M.), yet it appeared in abstract before that of S. and M., *i.e.*, in the *Proc. Amer. Physiol. Soc.* for February 1911 (*Amer. Journ. of Physiol.*).]

These two investigators performed intravenous injections of sheep's pinealine—but in a more concentrated form than that used by Dixon and Halliburton<sup>75</sup>—into dogs, cats, a rabbit, and a sheep. They confirm the findings of Dixon and Halliburton that the effect on the cat's blood-pressure is small. They found that, with a fall of blood-pressure, there was a vaso-dilatation in the intestines, a slight improvement in the beat of the isolated cat's heart, and a transitory diuresis (associated with glycosuria in about 80 per cent. of the cases). They found also slight effects on respiration: in a sheep there was gradual increase in depth, lasting for some time after the injection. They note that these pinealine effects are relatively slight when compared with those of other glands known to furnish internal secretions.

SCHÄFER and K. MACKENZIE<sup>78</sup> (July 1911) failed to confirm the earliest findings of Ott and Scott<sup>76</sup> (1910) on pinealine and on thymus extract, but confirmed them on infundibulin and on corpus luteum extract. The source of their pinealine is not stated. Their work was performed on lactating animals—chiefly cats, but also a few dogs.

K. MACKENZIE<sup>79</sup> (December 1911), in a renewed study of the subject, found that intravenous injection of boiled pinealine of

sheep gave a small, but distinct, stimulating effect on mammary secretion in cats in varying stages of lactation. He thought that the pinealine effect "might be due to the presence of a small quantity of pituitary extract absorbed from the surrounding cerebro-spinal fluid, but he failed to obtain any effect from the cerebro-spinal fluid itself, also from extracts of brain substance." He suggests that, if it were sufficiently inspissated, the cerebro-spinal fluid might possibly show the presence of the pituitary galactagogue; but he had not had an opportunity of trying this experiment at the time of sending in his MS.

### (2) *Electrical Stimulation Method.*

E. VON CYON<sup>74</sup> (1903) appears to be the only observer who has applied the method of electrical stimulation of the exposed pineal body. He succeeded in doing this in the rabbit. He obtained a lessening in size of the pineal with a slight change in its position, but no alteration of its colour: he therefore rejects a vaso-constriction as the cause of the diminution of size. It is very unlikely that either striped or unstriped muscle-fibres are responsible for this diminution of volume, for no one has ever found either kind in the rabbit's pineal. Von Cyon admits that the pineal contraction causes mechanically a flow and afflux of cerebro-spinal fluid. The suggestion has been made that the lessening of size may be due to an inhibition of pineal secretion: but we must remember that at present we lack conclusive proof that the pineal really has a secretion to be inhibited, though such a hypothesis will probably prove to be correct.

### (3) *Destruction of the Pineal by Cautery.*

SARTESCHI<sup>52</sup> (1910), who operated on eleven rabbits, is said to have adopted this method in some instances; but his results were negative.

EXNER AND BOESE<sup>80</sup> (1910) applied this method to young rabbits; only six out of ninety-five animals lived to the period of sexual maturity. Their results were negative.

We are now able to understand why the method has proved a failure; for recently Foà<sup>81</sup> has shown that it is not possible to destroy completely the rabbit's pineal by the cautery. He refers to Staderini's<sup>82</sup> study of the topography of the rabbit's pineal body:

he shows that the method adopted by Exner and Boese could, in most instances, destroy only that part of the rabbit's pineal which is situated between the vermis cerebelli and the cerebral hemispheres: Foà finds that the rabbit's pineal is 15 to 16 mm. in length, by 5 to 6 mm. breadth in its distal portion: he found that in the rabbit the danger of wounding venous sinuses and of damaging the vermis cerebelli or the occipital lobes is very great: in short, it is not possible to even extirpate the rabbit's pineal completely.

It follows from this that the negative findings from the application of the cautery method are due to the fact that the destruction of the pineal was incomplete.

#### (4) *Extirpation of Pineal Body.*

SARTESCHI<sup>52</sup> (1910) applied this method in some of his eleven rabbits: only two survived, both being females: in one the extirpation was said to be complete, but the animal died, without discoverable cause, four months after the operation; both these female rabbits became very emaciated and had a retardation of development; though both animals were kept with males, they did not breed. [It seems very doubtful, from the abstracts of Sarteschi's paper known to me, whether this was connected with the pineal body at all: possibly the post-operative emaciation was responsible: in any case, in only one of the two animals was the extirpation claimed as a complete one.]

EXNER AND BOESE<sup>80</sup> (1910) attempted this method in some of their ninety-five young rabbits; of these, twenty-two were kept for a long time: but only six till puberty, three being males. No difference in weight, nor in reproductive faculty was noted. But, as I shall show presently when I come to Foà's researches, it is doubtful whether the extirpation was complete, or is indeed possible in the rabbit.

BIEDL<sup>83</sup> (1910) is reported to have performed some extirpation experiments, with negative results. But Foà<sup>81</sup> says that Biedl's account is very short: I have failed to obtain Biedl's important monograph.

FOÀ<sup>81</sup> (1912) has given us far the most valuable experimental study of the pineal body. But at the outset of his inquiry, he came to the astonishing conclusion that the pinealine injection-method had been worked out, and was not worthy of re-study.

[I pointed out in December 1910<sup>88</sup> that not only is this untrue, but the subject had not even begun to be studied properly, because no one had tested the effects of pinealine taken from very young or newly-born animals. Even now, at the end of 1912, my statement still applies: but I have reason to believe that before long we shall have some experimental work published—on the lines of the suggestions made by me in 1910—by two physiologists, with whom I have been in private correspondence on these and other points concerning the pineal body.]

Foà began his work by a preliminary exact study of the topography of the rabbit's pineal body: he performed a preliminary series of extirpation experiments: he found that it is extremely difficult to destroy the whole of the head of the pineal body of the rabbit without injury to the vermis and the occipital lobes: hæmorrhage is also very great. He found that young rabbits, of 1 to 2 months, died within three days of operation. He therefore examined Gallus: he found that the topography of its pineal resembles that of the rabbit: but he was able to prove that complete extirpation was possible in chickens. He extirpated completely the pineal in sixty-three chickens aged from 3 to 5 weeks: fifteen survived, three being males: at this early age he found it impossible to decide the sex—hence the small number of cockerels surviving. During the two or three months following the operation the animals remained rather smaller than the controls and were torpid and listless; after three months they began to develop vigorously, and their bodily development overtook that of the controls, and remained within normal limits. After eight to eleven months, the combs and the testes of the cockerels showed great hypertrophy; the figures are very striking. One cockerel crowed thirty-six days before the control, mated forty-seven days sooner, showed 35 gr. greater body-weight, his testis was 9 gr. heavier, and his comb 38 gr. heavier, at the age of 8 to 11 months the pinealectomised cockerels showed the same degree of body-development and generative capacity as the controls. In some of the control animals Foà had performed a sham operation which consisted in an exact copy of the full operation with the exception that the pineal body was left *in situ* uninjured. When pinealectomised pullets, which had begun to lay, were isolated with pinealectomised cockerels, their eggs proved fertile on artificial incubation. Autopsy showed no appreciable macroscopic changes when compared with the controls: the examination included brain, pituitary, thymus, thyroid, adrenals

heart, lungs, kidneys, all the abdominal viscera, bones, and panniculus adiposus. Foà reserves a report of the histological findings for a subsequent paper: he promises also a comparative study of the pineal body at various ages. [There is one omission in his excellent paper that disappoints me: he gives no particulars as to the size, or generative capacity, of the progeny of (1) mated pinealectomised cockerels and pullets; (2) pinealectomised cockerels mated with normal pullets; (3) pinealectomised pullets with normal cockerels. The importance of these needed experiments will be clear when my own interpretation of Machell's case of sexual precocity in a boy is referred to in my general discussion.]

Foà's list of formal conclusions is as follows:—

(1) Complete removal of the pineal of chickens, aged 20-30 days, is possible.

(2) (Refers to the early post-operative torpor, listlessness, and retardation of growth already detailed.)

(3) In pinealectomised cockerels there is a premature development of the primary and secondary sexual characters (sexual instinct, crowing, comb).

(4) At 8-11 months the operated males showed hypertrophy of comb and testes.

(5) No macroscopic changes are found in the endocrine glands.

(6) Pullets, pinealectomised during the first month of life, show at the end of 8 to 12 months no differences of development, generative capacity, appearance, or size of organs, from those of non-operated pullets.

Thus he alters Marburg's scheme in one important particular, viz., he points out that a-pinealismus (in cockerels) leads to the conditions—or some of them—described by Marburg as due to hypopinealismus. At present we know nothing of hypopinealismus from an experimental point of view. And it is quite possible, I think, that we never shall.

#### (5) *Effects of Castration on the Pineal Body.*

SARTESCHI<sup>52</sup> (1910) failed to find any changes in the pineal body of animals castrated in early life: from the abstracts of his paper I gather that this applies to rabbits; but, as he studied histologically so many varieties of mammals, he may have applied the castration method in others besides rabbits.



BIACH AND HULLES<sup>84</sup> (1912) castrated fifteen kittens, aged 3 to 4 weeks: half of each litter were kept as controls: nine lived, viz., seven males and two females; all were kept for seven or eight months. Their pineals were hardened; thin paraffin sections cut, and stained with hæmolæne-eosin. Constant atrophy of the pineal body was found in both sexes: the atrophy is described as involving not only the whole gland but also its individual cells. In one cat, aged 3 months, castration was performed: at this age the cells of the cat's testes are functionally active: exactly the same pineal changes were found as in the castrated kittens. The parenchymal cells of the pineal body were scattered, instead of being compact; and the intercellular spaces were larger than normal. The authors conclude that, while their own observations show that Marburg's hypothesis of the functions of the pineal goes perhaps too far, yet they bear out his assertion of the contrast between the pineal and the pituitary, while they also show—for the first time—that, whereas it is well known that castration causes pituitary hypertrophy, it causes atrophy of the pineal.

#### (6) *Needed Experimental Procedures.*

Two years ago I drew attention<sup>88</sup> to at least three methods of pineal experimentation that had been neglected by all those investigators with whose writings I was then acquainted. And even now, towards the end of 1912, it is as true as it was in 1910, that (1) pinealine from young animals, (2) pineal feeding, (3) pineal grafting, have not yet been tested. Fortunately, however, this deficiency in our present knowledge of pineal physiology will soon probably be removed by two physiologists with whom I have been corresponding privately on certain aspects of pineal physiology. The best way now to deal with the subject will, I think, be to deal first with pineal feeding, grafting, and the pinealine method, and then to take seriatim the four other experimental methods which I have detailed in the subsection 5 of this section of my paper.

Pineal feeding might be tried (1) on normal animals, young and old; (2) on pinealectomised animals, young and old; (3) on completely hypophysectomised puppies; (4) on castrated animals, &c., &c. Pineal grafting might be tried in the same conditions. In addition both feeding and grafting might be tried on young and adult animals whose thyroid, adrenals, &c., had been previously extirpated.

#### 1. *The Pinealine-Injection Method.*

(A.) *Pinealine from Very Young Animals.*—It is to be hoped that, in addition to mammalian and avian pinealine, we shall have tests of

pinealine from lower vertebrates, especially snakes, amphibia, and fishes.

(1) Can we thus set up an experimental hyperpinealism? In all cases a careful histological examination should be made of all the endocrine glands, the bones, subcutaneous fat, and mammary glands (of both sexes); and I think we ought to include also sympathetic ganglia, the so-called paraganglia, the carotid bodies, &c., &c.; in short, our histological examination ought to comprise all the organs of what some writers call "the endocrino-sympathetic system."

(2) Has young pinealine any effects on adult animals?

(3) Does it prolong the duration of life in completely hypophysectomised puppies?

(4) Does it modify the known effects of thyroidectomy, adrenalectomy, &c., in young or adult animals?

(5) Have thyroidectomy, thymectomy, adrenalectomy, or castration (both sexes) any modifying effects on the physiological activity of the pinealine of young animals?

(6) Do extracts prepared from the pituitary and other glands of pinealectomised chickens give their usual injection effects?

(B.) *Pinealine from Adult Animals*.—Undoubtedly we shall have both a reinvestigation of some of the experimental findings of Ott and Scott, and of K. Mackenzie, and a further and more extended new investigation. There is one striking omission on the part of all workers from the time of W. H. Howell (1898) up to Ott and Scott (1912), viz., no histological examination has followed their experimental studies. In any case I fail to see how anyone, who is familiar with the most recent work of Ott and Scott, can maintain that the adult-pinealine method has been anything like worked out yet: we may yet learn a good deal from it of exact pineal physiology. I may add that it is conceivable that we may one day have a pineal medication; it seems to be about the only form of organo-therapy that has not been tried; but let us pray that it may follow, and not precede, a careful experimental study.

## 2. *The Electrical Stimulation Method.*

Let us first have a reinvestigation of von Cyon's solitary study of stimulation of the exposed pineal body: but let us have, in addition, an attempt to test the physiological effects of pinealine obtained from a young animal immediately after such direct pineal stimulation. It seems at least possible that some modification of the activity of the pineal might be set up by this direct stimulation of the gland.

Another very important application of the electrical method—not yet tried—is the following: At present we do not know whether the sympathetic nerve-fibres, which Cajal<sup>46</sup> has found in the pineal body, are secretory in function, or vasomotor, or both secretory and vasomotor. We have at present no exact knowledge of the origin of these sympathetic fibres, of their course, nor as to how they reach the pineal blood vessels and the external side of the glandular cells of the pineal body. But it seems probable that (1) they rise in cells of the inferior cervical

sympathetic ganglion, (2) pass *via* the vertebral plexus along the basilar artery, and (3) thence along the posterior cerebral and superior quadrigeminate arteries to the pineal arteries. If this be correct, we might expect to obtain some modification of pineal secretion by (1) stimulation of the inferior cervical ganglion or the vertebral plexus, or (2) extirpation of that ganglion. In addition, drugs might be applied in combination with these methods. One would suggest too that, after such stimulation or extirpation, pinealine should be prepared from the gland and its effects tested by injection. I think the extirpation would, in this case, probably have to be bilateral, whereas unilateral stimulation would suffice. But one can hardly doubt that physiologists will, by adopting such methods, add substantially to our knowledge of pineal physiology. We know now that secretory glands are of two types, viz., (1) those which receive true secretory nerve-fibres, *e.g.*, the adrenals *via* the splanchnics, and (2) the mammary gland, whose secretory function has been proved to be capable of acting quite apart from connection with the nervous system. At present we do not know to which category the pineal body belongs. In concluding these remarks I may say that there should be no difficulty in tracing degenerated nerve-fibres into the pineal body, after extirpation of the inferior cervical ganglion, *i.e.*, if its sympathetic fibres have the origin and course which I have here suggested.

### 3. *The Cautery Method.*

This is a bad method; when it does not fail, it is likely to do too much. Even if definite effects were obtained by its use, we should be forced to discount their value, because it may be correct that pineal syndromes may be due, in part at any rate, to damage done to hypothetical centres, or tracts, situated near the pineal body.

### 4. *Pineal Extirpation.*

This method may well have a great future; the first thing is, of course, to find out in what animals complete pinealectomy can be performed, as in Foà's chickens, without damage to neighbouring structures and without danger to life. I may just repeat the hope, which I have expressed already, that Foà's researches may be extended in the following directions: What is the size, weight, appearance, sexual activity, and generative capacity of the progeny of (1) pinealectomised cockerels mated with normal pullets, (2) pinealectomised pullets with normal cockerels, (3) pinealectomised cockerels with pinealectomised pullets? Of course a searching histological examination would be made of the endocrino-sympathetic system of the resulting progeny in each category.

### 5. *Effect of Castration on the Pineal.*

The experiments of Biach and Hülles<sup>84</sup> should be repeated, and should be performed in other animals besides cats. And it is to be hoped that we shall be given a more elaborate histological examination of the pineal body of castrated animals than that given by them.

Further, it is of vital importance that we should learn what is the exact histological condition of the pineals of very old animals which had been castrated during the first few weeks of life. [My reason for insisting on this point will be given in my general discussion.] Finally, we want to know what effects, if any, has castration of very old animals on their pineal body.

In concluding this section, I should like to express the hope that both the analytical and the physiological chemist will teach us something of value on the obscure question of pineal chemistry: one cannot doubt that this method of inquiry has a future in front of it.

## 6. GENERAL DISCUSSION.

We come now to the greatest difficulty of all—what use shall we make of the vast mass of facts which have been accumulated, as the results of the labours of numerous investigators in several fields of inquiry, during the modern era, which may conveniently be said to begin with the studies of Faivre<sup>2</sup> in 1854? First of all, a broad survey of the pineal body from all aspects leads, in my opinion, to one fundamental conclusion, viz., that it is probably functional in all those vertebrates which possess one. The pineal body is not, as so many even good authorities have assumed, a rudimentary, functionless, degenerated, or degenerating and disappearing organ. It is something entirely different, viz., a metamorphosed—perhaps also a metamorphosing—organ. If the pineal were really a degenerating and disappearing organ, Nature has been slow indeed in getting rid of it: she has had ever since the far-distant palæozoic era. Let anyone just think of the fact that modern snakes, which are practically identical with those of the mesozoic era, have an unusually vascular pineal organ. Will he seriously ask us to believe that Nature would send a lot of blood to an organ that has no need for it, and thus keep a certain amount of blood from other organs and tissues which do need it? Now it does not in the least follow that, even if the pineal body be functional in all those vertebrates that possess one, its functions are of necessity identical in all vertebrate classes. We must here remember that we are to-day merely at the threshold of our inquiry into comparative pineal physiology. The alleged absence of a pineal organ in certain lower vertebrates is worthy of a passing notice here: its absence in *Myxinoids* is not in the least surprising; for this group of the *Cyclostomes* is known to be—in the main—a very degenerate one. The absence of a pineal organ

in *Crocodylia* is certainly strange, but I suspect that they will yet be found to possess one. For palæontologists tell us that existing *Crocodylia* are practically identical as to size, osteology, &c., with those of the mesozoic era; crocodiles, like reptiles, have lived a nice, easy, lazy life through the ages: it seems unlikely to me that crocodiles should lack a pineal organ while snakes have a highly vascular one. One would also expect to find a pineal organ in *Torpedo*; a reinvestigation is desirable. We see that when an animal type is going to degenerate—as, for example, the *Myxinoids*—it loses its pineal organ entirely: it does not keep one, as do its cousins the *Petromyzonts*, and almost all higher vertebrates: still less does it keep a vascular one. It seems to me that the study of *Myxinoids* tends to show the absurdity of the non-functional hypothesis of the pineal organ of vertebrates. The variations of the vertebrate pineal body are so great that it seems probable that its importance varies in various vertebrate classes, and even sometimes in closely related members. When we come to comparative histological studies, the functional activity of the pineal body is strongly suggested by the work of many investigators, specially Faivre<sup>2</sup> (1854), Leydig<sup>7</sup> (1866), Bizzozero<sup>30</sup> (1871), Hagemann<sup>32</sup> (1871-72), Cajal<sup>46</sup> (1895), Galeotti<sup>47</sup> (1896-97), Dimitrova<sup>50</sup> (1901), Sarteschi<sup>52</sup> (1910), Krabbe<sup>53</sup> (1911), and Jordan<sup>57</sup> (1911).

When we study the clinico-pathological aspects of the pineal body, we see some evidence that it has, in early childhood, probably some relationship with body-growth and sex-characters. But it seems to be difficult to establish very definite conclusions as to pineal physiology from these cases, because not only do pineal lesions fail in 90 per cent. of the recorded cases to give any metabolic symptoms, but, of the 10 per cent. which do give such symptoms, some give mixed symptoms and signs, as in Raymond and Claude's case;<sup>70</sup> whereas others give bodily overgrowth with premature sexual and genital development; and yet others give the latter without much of the former. We can no longer entirely subscribe to Marburg's<sup>68</sup> three syndromes, for Foà's<sup>81</sup> experiments on chickens teach us that a-pinealism leads to testicular hypertrophy (at a certain age), with over-development of secondary sexual characters, but no marked bodily overgrowth, at least nothing approaching giantism. It is, of course, true that Foà's conclusions on these matters are based on his findings in so small a number as three completely pinealectomised cockerels. It seems

at least possible that the cachexia, which Marburg attributes to a-pinealismus, may be not really of pineal origin: but here again we must remember that Foà found in his cockerels an early period of torpor, poor appetite, and listlessness, which passed away, however, with the beginning of vigorous growth. As to Marburg's syndrome due to hyperpinealismus, at present we know nothing whatever of such a state, so far as experiment is concerned, the reason being that no experimentalist has yet adopted my suggestions,<sup>88</sup> made in 1910, as to the application of pineal feeding and grafting and injection of pinealine from very young animals. But the obesity that has been found in some cases of pineal tumours may not, after all, be of pineal origin; for even absence of any recognisable histological changes in the pituitary or other glands in such cases does not exclude the possibility of a dys-pituitarismus due to subtle metabolic or chemical changes of which at present we have no knowledge. Then, again, adiposity occurs in so many other conditions, and its modes of production are still so obscure that we must conclude, I think, that it is uncertain whether hyperpinealismus in man ever causes adiposity *per se*. We must wait for the verdict of properly applied experimentation.

As to the embryonic hypothesis of the production of pineal syndromes in some cases of pineal tumours, which was suggested by Askanazy, cited by Pappenheimer,<sup>64</sup> I think we must now dismiss it: the experiments of Biach and Hülles,<sup>84</sup> and those of Foà,<sup>81</sup> seem to point clearly to the existence of a pineal function, in young mammals and birds respectively, which is related to the development of the testes: the experiments of Biach and Hülles include also the ovaries. In connection with the embryonic hypothesis, I may quote here a passage from the monograph of Poppi<sup>86</sup> (1911)—to which I have failed to gain access. Poppi is said to hold that an embryonic lesion of the hypophysis cerebri can, by causing lesions of either the pineal body or the thyroid, alter the thymus which, in its turn, causes generalised lymphatic lesions and especially hypertrophy of the pharyngeal tonsil, which causes a lesion of the pharyngeal hypophysis. But is it a fact that an embryonic lesion of the hypophysis cerebri can cause a pineal lesion?

So far as recent experiments go, we must, I think, provisionally conclude that one of the functions of the mammalian

and avian pineal body is to exercise an inhibitory influence on the development of the testes in early life (prepuberal), and, through them probably, on the appearance of the secondary sexual characters. Its relation to the ovaries needs further experimental study in several directions which I need not specify here.

It might be claimed that the embryonic hypothesis may after all be correct: but I think the utmost we can now admit in its favour is that, if embryonic lesions do sometimes lead to definite pineal syndromes, they probably do so by virtue of their stimulating or inhibitory effects on the specific functions of the pineal body.

There is one matter on which most authors seem to lay insufficient stress: we are all so apt in these days to talk of states of excess or defect of secretory processes in endocrine glands that we are in danger of forgetting that possibly perversion of secretion, which may quite well be due to subtle chemical changes which give no recognisable histological alteration, may really be sometimes more important than mere excess or deficiency. Again, it is often forgotten that states of excess and deficiency not uncommonly occur simultaneously in a gland which is the subject of tumour-formation, or pressure. It seems then unsafe to conclude at present that a hyperpinealism may of itself cause adiposity; for aught we know to the contrary, a dyspinealism may possibly do so sometimes, and may at other times cause a hypopinealism or an a-pinealism, and at still others a mixture of excess and deficiency. If we turn for a moment to acromegaly, we seem to get some confirmation on these points: though the balance of opinion is now that that disease is due to hyperplasia of the glandular lobe of the pituitary, and that Marie's original teaching that it is due to hypopituitarism, is in the main erroneous, yet we know that pituitary medication, which is usually harmful in the disease, has sometimes done some good. We can hardly doubt, I think, that cases of acromegaly vary (as do all diseased states): hyperpituitarism preponderates usually, but it is sometimes accompanied by some degree of hypopituitarism: Marie was therefore not wholly in error. So far as the pineal body is concerned, I think the solution of these matters rests mainly in the hands of the experimentalist and the chemical physiologist.

A reference to Machell's<sup>72</sup> case 2 (boy) seems to be needed

here. When I abstracted his paper in January 1912 I drew "special attention to the heavy weight of the patient's father at birth, his early development, and ultimate small size when grown up." I suggested that "this may mean that the patient's father showed a condition of non-fatal hypopinealism in early life, to which was added during adolescence a condition of hypopituitarismus." I have already indicated the experimental methods—or some of them—by which the accuracy or the error of this suggestion may be tested. It seems to me that we must beware of assuming that every case of hypopituitarismus must of necessity conform in all respects with the full adiposo-genital syndrome of Fröhlich; whereas it is rare, states of incomplete hypopituitarismus are common—unless we are greatly mistaken. What is going to happen to Machell's boy, or to Pellizzi's case 1? [I assume that Pellizzi's case 1 had no ill-health, and is presumably still alive.] Will Machell's boy get intracranial signs and die? If he has really an intracranial tumour, it is very slow in giving any purely intracranial signs. Will this boy, who is now so big, grow up small eventually? Are there sometimes cases of non-fatal pineal lesions—not due to gross disease—which can give effects such as this boy shows? Clearly, all such cases should always, if possible, be followed up to adult life, if they reach it. There seems to be only one known condition, besides pineal tumours, which can for a long time give genital and sexual overgrowth somewhat similar to that shown by Machell's boy, or Pellizzi's boy (case 1), viz., tumours of the adrenal cortex. But, whereas all those cases of pineal tumours, which were associated with genito-somatic precocity, have occurred in boys, cortical adrenal tumours are excessively rare in boys, and never—so far as we know—give rise in boys to genital precocity. It is unlikely, therefore, that Machell's case and Pellizzi's case 1 are examples of cortical adrenal tumours. Of course, if they are, we have an easy explanation of the absence in them of intracranial signs and symptoms. [An immensely large and valuable body of facts will be found in Glynn's excellent paper<sup>86</sup> on adrenal tumours, &c., 1912.]

Many authors have cited the presence in the pineal body of such a large amount of neuroglial tissue as a proof of its functional unimportance. Now I am one of those who hold that everywhere neuroglial cells and fibres have some function, or functions,



quite apart from their mere mechanical one. Even if the pineal were composed of nothing but neuroglial tissue, we should not be justified in stating that it is functionless. Let the adherents of the "purely supporting nature" hypothesis of neuroglia answer the following questions, if they can: If the pineal body be a rudimentary, useless, disappearing organ, of what possible use to it can a supporting tissue be? What would the supporting tissue support but itself? And how would the presence of a self-supporting tissue that had no other functions benefit any animal organism? No, not only is neuroglia not solely a supporting tissue, but I believe there is no tissue in the animal body that has only that function: every tissue has probably more than one function.

The crucial test whether a gland furnishes an internal secretion consists in recovering from its efferent vein, or veins, a substance which, on injection, gives specific effects. Now, in the case of the pineal body, this test may prove to be difficult of performance: so far as I know, it has not yet been tried. The pineal veins, which enter the veins of Galen of both sides, are small, and might prove difficult of puncture; still, I hope an attempt will be made. It is probable that arterial changes seldom cause pineal syndromes; the human pineal is supplied by the superior quadrigeminate branches of both posterior cerebral arteries; bilateral disease of these trunks must be exceedingly rare; but, since the superior quadrigeminate artery supplies also the anterior corpus quadrigeminum, it seems probable that a lesion of that body may affect the pineal by cutting off some or all of its arterial supply—quite apart from pressure effects—and may thus modify its secretory processes. We may recall the case of Biancone, of tumour of the corpora quadrigemina, in which masturbation was a prominent feature: this has been connected causally with the pineal body by some writers. Be that as it may, the pineal body deserves a much closer and more conscientious histological study at the hands of neuro-pathologists than it has yet received; it may be much more often affected secondarily than we know at present: we may learn facts of value, if this be done. As to the origin and course of the sympathetic fibres which have been found by Cajal<sup>46</sup> and others in the pineal body, nothing definite appears to be known; one would suppose that they come from the inferior cervical sympathetic ganglion, by the vertebral plexus, along the basilar artery. There seems to be a promising

field here for research, *e.g.*, the effect, if any, of extirpation of that ganglion, or stimulation, on the pineal body: it is conceivable that by such means the secretory activity of the pineal might be modified, in the case of young animals especially: one would like to know whether pinealine obtained after prolonged sympathetic stimulation, or extirpation, gave more or less than its usual effects on injection. I have dealt with the subject in section 5.

We come now to a very important subject which is a great stumbling-block to many writers, viz., the question of the pineal involution which occurs normally in childhood. Some writers seem to imply that, because a partial pineal involution occurs then, therefore the pineal has no function or functions after childhood. I look on this attitude as entirely erroneous. At the present time we have evidence which suggests that this involution begins somewhere about the age of 7 years in man, and ends normally at puberty. This means that there is (1) an early pineal function (prepuberal), which is active only in the first few years of life, in inhibiting premature sexual and genital development: a gradual involution occurs during the second half of prepuberal life, and by the time of puberty it is complete; those pineal elements, then, which subserve this prepuberal sexual function have now finished their work: they therefore undergo involution; we find evidence, then, of degeneration and disappearance of some pineal elements, together with a slight reduction in the size of the pineal body which later is still further reduced; (2) the other pineal function—which depends on those pineal elements that do not undergo involution at puberty—is active at any rate from puberty to extreme old age; we cannot, however, at present decide whether it begins only at puberty, for it may really be active from birth; nor do we know its function or functions. We have some evidence that pinealine from adult animals has the property of stimulating some unstriped muscles; but we cannot at present say anything definite about this non-sexual pineal function. Thus, it seems probable that of the two (or more) functions of the pineal body, one comes to an end normally at puberty, the other (or others) exists either from birth to death, or from puberty to death; of these the former is sexual, the latter at any rate not primarily sexual.

It is not yet possible to admit that Biach and Hülles<sup>84</sup> interpreted their own experimental findings wholly correctly; for

their second figure, that of the pineal of a cat of 7 or 8 months of age, which had been castrated during the first few weeks of life, shows that, although many pineal elements have disappeared and the remaining parenchymal cells are a little smaller, and apparently less defined, than those of a normal cat's pineal, shown in Fig. 1, yet we are not entitled to say from this second figure that the atrophy of the pineal is anything like complete. We are not yet in a position to say whether, if these cats had been kept to extreme old age before the histological examination was made, their pineals would have shown a complete and total atrophy. This is the reason why I have urged, in the section dealing with needed experimental procedures, that it is essential that a histological examination should be made of the pineals of very old animals which had been castrated in very early life. The fact that the human pineal body appears to lessen in size after puberty—without disappearing—seems to point to the existence of at least two distinct functions, of which one normally finishes its work at puberty, and the other, whenever its work may have begun, goes on to the end of life.

Seigneur<sup>6</sup> has well said, in a burst of graduation eloquence: "The pineal gland, having known its days of glory, has fallen into neglect." At the same time we see signs on all sides that numerous active investigators are beginning to study the pineal in a more enlightened manner. The "rudimentary, useless" hypothesis has—unless I am greatly mistaken—gone for good. By the time this paper sees the light, we may have learnt from Foà what histological changes, if any, follow on pinealectomy in young chickens. We have to remember that the subject of pineal physiology is almost an untouched field of inquiry. In opening up new fields of inquiry, as in developing new countries, men always make some mistakes and miscalculations; and this is especially likely to occur in such a difficult subject as pineal physiology. In this review I have said but little on the obscure question of interglandular relationships. The most we can at present say, with any confidence, appears to be this: the pineal of young mammals and birds has (1) certainly a relationship with the development of the testes and, probably through them, with the secondary sexual characters and bodily growth; (2) probably a relationship with the pituitary, and the adrenal cortex; (3) possibly with the thyroid and thymus; (4) possibly with the

ovaries: the experiments of Biach and Hulles<sup>84</sup> suggest it, whereas those of Foà<sup>81</sup> leave us in doubt—a doubt which may disappear when his histological studies shall be in our hands. [We shall probably learn before long from two physiologists, who are experimenting on certain aspects of pineal physiology which I have privately suggested to them, whether it is possible to induce an experimental hyperpinealism by means of (1) pinealine from young animals, (2) pineal feeding, (3) pineal grafting.] It may quite well happen that embryonic pineal extracts may prove useful in teaching us more about the pineal body: the young science of experimental embryology has already gained many victories—especially in the hands of the brilliant school of American embryologists—and it undoubtedly has a future in front of it.

[Among the most generally useful papers on the pineal body may be mentioned: (1) "On the symptomatology of pineal tumours," Bailey and Jelliffe,<sup>63</sup> Münzer,<sup>87</sup> and Seigneur:<sup>6</sup> his thesis is excellent, but is weak on the experimental side; of these three writers, Münzer gives few references, whereas both Bailey and Jelliffe and also Seigneur give full references to all the recorded cases of pineal tumours; Seigneur gives references to as many as 65 cases in chapter 5 of his thesis;<sup>6</sup> it would be difficult to praise his industry too highly: he has even succeeded in finding my little letter on pineal experimentation,<sup>88</sup> which has naturally been overlooked by most recent writers on the pineal body owing to the fact that it was published in the correspondence columns of the *British Medical Journal*. (2) On the ancient history of the pineal body the papers by Faivre<sup>2</sup> (1857), Legros,<sup>3</sup> and Peytoureau.<sup>4</sup> (3) On the comparative anatomy and development, the papers by Studnicka,<sup>5</sup> Dendy,<sup>16</sup> Terry,<sup>17</sup> and Warren:<sup>18</sup> the postscript in Dendy's 1911 paper,<sup>16</sup> dealing with the work of Nowikoff (1910) in reptiles, is well worth study. (4) On the histology, the papers by Faivre<sup>2</sup> (1854), Dimitrova<sup>50</sup> (1901), Sarteschi<sup>52</sup> (1910), Krabbe<sup>56</sup> (1911), and Jordan<sup>57</sup> (1911). (5) On the experimental physiology, the papers by von Cyon<sup>74</sup> (1903), Dixon and Halliburton<sup>75</sup> (1909), Ott and Scott<sup>76</sup> (1911-12), Schäfer and Mackenzie<sup>78</sup> (1911), Sarteschi<sup>52</sup> (1910), Biach and Hulles<sup>84</sup> (1912), and, above all, Foà<sup>81</sup> (1912). I may add that I have not been able to refer to the paper on pineal cysts by F. Nasseti (*Riv. speriment. di Freniat.*, Vol. 38, 1912, p. 291), as it had not reached the library where I work when my MS. was sent in.]

## 7. CONCLUSIONS.

1. The facts of comparative anatomy, embryology, histology, clinico-pathology, and experimental physiology, point to the belief that the pineal body is functional in all those vertebrates which possess one.

2. The pineal body is a metamorphosed organ; not a rudimentary, useless, degenerated, degenerating, or disappearing organ; the phenomena, which have been urged in favour of the latter hypothesis, have been erroneously interpreted.

3. The pineal body probably furnishes an internal secretion; the crucial test for this may prove difficult of attainment; it has not yet been attempted.

4. So far as our at present imperfectly applied experimental studies have taught us, the pineal body of very young birds and mammals has an inhibitory action on the development of the testes and—probably through them—on bodily growth and the appearance of the secondary sexual characters.

5. A relationship of the pineal body with the ovaries is suggested by certain experiments,<sup>84</sup> but has not yet received confirmation from those of Foà<sup>81</sup> (1912).

6. A relationship with the pituitary and the adrenal cortex is probable, with the thyroid and thymus possible; but on these points nothing certain is yet known.

7. Histological studies, and also the most recent experiments of Ott and Scott<sup>76</sup> on adult pinealine (1912), seem to show that, in addition to its prepuberal-sexual function, the pineal body of man and other mammals has at least one other function; it is not primarily, at any rate, a sexual one; and it appears to be active either from puberty to the end of life, or from birth.

8. A true partial pineal involution begins normally in childhood at about the age of seven years, and is normally complete at puberty; its meaning is that the prepuberal sexual function of the pineal body has come to an end, and therefore involution occurs of those pineal elements which subserve that function.

9. The adult mammalian pineal body seems to have definite actions on some unstriped muscles (Ott and Scott especially), and it is functionally active normally up to the end of life.

10. The neuroglial and connective-tissue elements of the pineal body may have specific functions, quite apart from their purely mechanical rôle; but nothing definite is yet known on this matter.

11. The size of the pineal body bears no relation to the size of the brain or the size of the body.

12. The great variations of the pineal body—sometimes even in closely related forms—suggest that its functions vary, and are relatively greater in some than in others.

13. We are not yet in a position to say how the pineal body functionates.

14. The future of pineal physiology lies probably mainly in the hands of the experimental and chemical physiologist, to a less degree of the pathologist, and possibly to some extent of the experimental embryologist.

15. An exhaustive study of the many methods by which our present imperfect knowledge of comparative pineal physiology may be increased will be found in sections 5 and 6 of this paper.

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## A CASE OF COMBINED DEGENERATION OF THE SPINAL CORD WITH AMYOTROPHY.

By GORDON HOLMES, M.D.

TRUE combined system degeneration of the spinal cord, excepting certain familial forms as Friedreich's disease, is a relatively rare condition, though pseudo-systemic degenerations, as those that occur in subacute combined degeneration and in certain general diseases as pernicious anæmia, are comparatively common. Though there may be no very great or general difference in the symptoms or in the clinical courses of the two conditions their pathological natures are essentially unlike. For in true combined system degeneration we have to deal with the simultaneous or successive affection, due to the same cause or to factors arising from the same cause, of two or more tracts or systems of fibres which are unrelated to one another both anatomically and functionally. Further, this degeneration is a purely primary phenomenon unconnected with any local vascular lesions or other injurious processes, and as a rule it attacks the peripheral portions of the longer fibres first and then gradually extends towards their cells of origin; the neurones, in fact, die backwards towards their cells, as an old and ill-nourished tree on which the topmost branches first decay while the trunk and roots preserve life longer. But even the occurrence of this form of combined degeneration has been questioned, as by von Leyden, for instance, who maintained that, apart from amyotrophic lateral sclerosis and a few other diseases, the combined degenerations must be ascribed to diffuse or local processes, such as a disseminated myelitis.

The case recorded here, which was under my care at the National Hospital for the Paralysed and Epileptic, undoubtedly represents a true combined systemic degeneration of the dorsal columns and of the pyramidal tracts of the spinal cord, but this system degeneration was associated with a rapid and progressive wasting of various groups of muscles owing to a primary disease of the cells of the ventral horns.

F. H., 39 years of age, a farrier, was first seen in the out-patient department of the hospital in August 1910. He came originally complaining of progressive weakness of his arms and legs.

His health previous to the onset of his present illness had been

excellent; he was always moderate in the use of alcohol and denied venereal disease, though he admitted the risk of infection. He had been married fifteen years and had a family of four children, who, with the exception of one who died in infancy, were alive and well; his wife had had no miscarriages. There was no history of any similar illness in his family. He was well and regularly at work till April 1910, when he had an attack of "influenza"; his symptoms then were those of a cold, with aching all over, and during it he felt hot and thirsty. By this slight illness he was kept from work for three or four weeks; while recovering he fell from a bicycle, but did not apparently hurt himself. He was able to continue at work till towards the end of May, when his right arm commenced to become weak gradually; at first there were aching pains in the limb, but these were never a prominent symptom. In July or the early part of August his gait was first affected, and his left arm became weak. His wife had noticed that his speech was indistinct for about two months.

When seen in August 1910 there was extensive atrophy of almost all groups of muscles in the upper extremities, greatest in the forearm and hand muscles, and more advanced in the right than in the left limb. No fibrillation was observed. All movements of the right arm and fingers were feeble, but the left arm though weak could be used by the patient. The muscles of the lower limbs were also small, especially below the knees, and flexion and extension of the ankles were very weak; he could, however, walk alone, but he staggered and his gait was feeble and unsteady. His tongue was at that time tremulous but not wasted, and his pupils were small but equal; the right was almost inactive to light, while the contraction of the left was sluggish and feeble. There was slight diminution of sensibility to touch and pain in his legs, but the sense of position and the appreciation of passive movement in them was more severely disturbed.

The knee-jerks were much diminished, and the ankle-jerks were absent, but stimulation of the soles gave extensor plantar responses.

The patient lived out of London, and was not seen again till he was admitted to hospital on 11th November 1910. He had become steadily weaker, his arms had wasted more rapidly, and for six weeks he had been unable to walk alone. For two weeks he had some difficulty in controlling his sphincters.



He states that during the attack which he describes as "influenza" his memory was defective—"he used to tell people the same thing over and over again"—but he believed this had passed off. On examination, however, he was found to be dull and apathetic, and his memory for even the details of his illness was poor and unreliable.

On admission his right pupil was larger than his left, and both were slightly excentric and irregular in outline; they reacted sluggishly and feebly to light but briskly on accommodation. There was no history of diplopia, and no strabismus, ptosis, or nystagmus. The muscles of his face moved well, but his lips were tremulous, and there was some fine tremor of his tongue when it was protruded. His right arm could not be raised from the bed, while the movements of the left were feeble and small in range. All the muscles of both hands were extremely wasted, as well as those of the forearms, and to a less degree those above the elbows. The abdominal muscles were very spastic, the patient was unable to sit up without support, and in the lower extremities there was obvious wasting of the anterior groups of muscles of the legs, and both limbs were very spastic and all their movements feeble. The patient was now unable to stand even with assistance.

No definite anaesthesia or analgesia was made out when the patient entered hospital, but he was now so dull and stupid that examination was very difficult; there was, however, beyond doubt some loss of the sense of position in his legs.

His arm-jerks, as well as his knee- and ankle-jerks, were now absent, and the abdominal reflexes could not be obtained, while the plantar responses were definitely of the extensor type. He had overflow incontinence of urine necessitating the systematic use of the catheter while he was in hospital, and he frequently passed faeces under him, but this seemed to be in part at least due to his mental state.

After admission to hospital his condition deteriorated rapidly. He became duller and more listless, and spoke only in reply to questions; his speech became more slurred and indistinct, resembling that of bulbar palsy, and in January 1911 he developed slight dysphagia as well. His limbs gradually wasted and contractures developed in his legs. His pupils remained unequal and irregular, and the reaction of the right to light was lost, while that of the

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left was very small and sluggish. He eventually died on 10th March 1911.

The Wassermann reaction in the blood obtained after death was strongly positive, even though the patient had been treated with mercury for a considerable period; unhappily the cerebro-spinal fluid could not be obtained for examination during life.

The autopsy was performed two hours after death by Dr Hinds Howell, to whom I am indebted for these notes made at the time, and for supervising the preparation of the histological sections. The spinal cord seemed small, and the ventral roots, especially those of the cervical enlargement, were atrophied and discoloured, and contrasted strongly with the large, healthy-looking dorsal roots. There was no thickening or obvious disease of the spinal meninges, but the soft membranes over the surface of the brain were milky and thickened, and contained an excessive amount of fluid. To the naked eye there was no abnormality in the brain excepting slight atrophy of the frontal lobes.

On microscopical examination the cerebral leptomeninges were found thickened and infiltrated with small round cells of the lymphocyte type, but larger cells with oval or spindle-shaped nuclei and more granular chromatin were found among them; these were evidently of adventitial or endothelial origin. This meningeal infiltration was generally denser around the vessels; there was, however, no tendency to gummatous concentration, and apart from the invasion of their adventitial coats by the infiltrating cells the vessels were normal.

In the cerebral cortex the most prominent change was due to some of the vessels entering it from the meninges, carrying in a perivascular infiltration in their sheaths. The extent to which this occurred was irregular; in certain regions it was absent, despite the presence of much round cell infiltration in the meninges, while in other regions there was infiltration around many of even the smaller vessels. Otherwise, the only definite cortical change was a slight chronic atrophy of some of the larger pyramidal cells, especially of the Betz elements.

The spinal meninges were but little thickened, and contained only a small number of infiltrating cells. The vessel walls were definitely thickened only in the degenerated and densely sclerosed columns of the cord.

The lesions in the spinal cord were most easily studied in

sections stained by the Weigert-Pal method. Throughout all regions there is degeneration in both the dorsal and the lateral columns. In the lateral column the degeneration is strictly limited to the area occupied by the crossed pyramidal tract. It can be traced caudalwards as far as the second sacral segment. Here and in the lumbar and the lower dorsal segments the degeneration is very severe (Fig. 1), but a certain number of normal fibres persist, though most of them appear reduced in size; no swollen or distorted fibres, such as are common near myelitic foci and in subacute combined degeneration of the cord, are found among them. The proportion of fibres persisting increases considerably in the upper dorsal and cervical segments, while in the highest cervical segments the affection is represented only by a general pallor, due rather to an atrophy of the fibres than to a loss in their number, in the region of the crossed pyramidal tracts (Fig. 3). This pallor diminishes in the medulla, and above this level the myelinated fibres of these tracts appear practically normal. From about the level of the tenth dorsal segment upwards there is some degeneration in the areas of the direct ventral pyramidal tracts; this is most marked in the upper dorsal segments, and it diminishes again in the highest segments of the cord (Figs. 2 and 3).

No other degeneration is visible by the medullary sheath stain in the ventro-lateral columns of the cord; the spino-cerebellar tracts are well myelinated and the other fibres of these columns stain uniformly well.

The degeneration in the dorsal columns may be most easily followed from the lumbar region. In the third lumbar segment (Fig. 1), for instance, it occupies a triangular area, the middle root zone, the fibres along the septum, those of the cornu-commissural region, the root entry zone, Lissauer's tract, and the dorsal root area being unaffected. This description applies to all the segments of the lumbo-sacral enlargement, but in the lower sacral region the degeneration is more diffuse and less intense. Both the extra- and intra-medullary portions of the dorsal roots are normal. In the lower dorsal segments the disease is less severe, perhaps, but it occupies the same relative position; there is in addition, however, some degeneration of the fibres ascending from the more caudal segments in the dorso-median column. There is no obvious loss of myelinated fibres in the ventral horns, but both

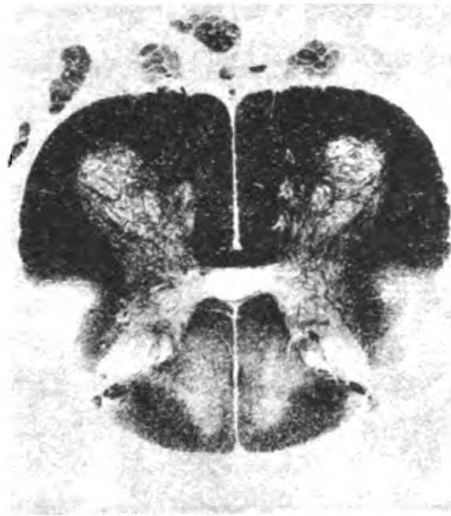


FIG. 1.—Section of the third lumbar segment. Weigert-Pal method.

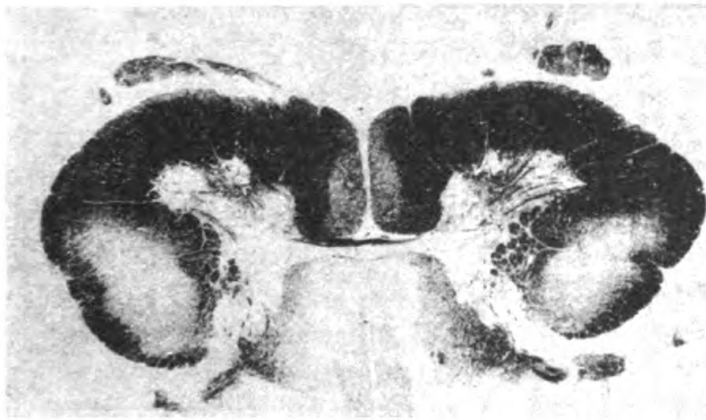


FIG. 2.—Section of the sixth cervical segment.



FIG. 3.—Section of the second cervical.

the dorsal horns and Clarke's column are poor in medullated fibres.

In the upper dorsal and the cervical segments the amount of degeneration in the ascending fibres of Goll's column is certainly more pronounced than in the lower regions of the cord (Figs. 2 and 3), and it increases cerebralwards to the dorsal column nuclei. The entering dorsal roots remain unaffected and the root entry zones contain a good number of fibres, while the part of the dorsal columns that is most affected is the dorsal root zone and the areas lying lateral to the paramedian septa, in the medial portion of Burdach's column (Fig. 2). Here there is also a certain loss of fibres in the cornu-commissural zone, but the fine fibres of Lissauer's tract remain unaffected.

In the brain-stem the only change visible in sections stained by the Weigert-Pal method is the diminishing pallor of the pyramidal tracts already referred to.

In no region of the cord is there any tendency to diffuse or annular degeneration such as results from meningeal or vascular disease.

The Marchi method only confirms the facts observed by the medullary sheath stain. The degeneration it reveals in the ventro-lateral columns of the cord is limited to the direct and crossed pyramidal tracts, and this seems older and more advanced in the lower than in the higher segments. The pyramids in the medulla contain only a few black granules, while in the pons these tracts are normal. The Marchi changes in the dorsal columns are identical with those described in the Weigert-Pal preparations; the degeneration seems older—the degeneration granules are larger, more conglomerate, and more grouped around the vessels—in the areas occupied by the ascending fibres in the higher cervical than in the lower segments of the cord. The extra-medullary portions of the dorsal roots are free from degeneration.

In addition the Marchi preparations revealed slight recent degeneration in the entering sensory root of one trigeminus nerve, and a few granules in the corresponding bulbo-spinal root; in the extra-medullary portion of the root the degeneration does not extend beyond the line of the neuroglial-endoneural junction.

In the degenerated areas of the cord there is a dense neuroglial sclerosis, greater in the dorsal than in the lateral columns; the

proliferated neuroglia is dense and compact, and in no place reticulated or vacuolated as it is in subacute combined degeneration of the cord. The sclerotic areas contain here and there pale inflated cells imbedded in them, which are evidently of neuroglial origin.

The ventral horns, especially in the cervical enlargement, have lost a considerable proportion of their large cells, and the majority of those that persist are shrunken, rounded in outline, and often contain an excess of pigment.

The histological changes in the wasted muscles are merely those which characterise secondary atrophy of spinal origin.

Thus in a man 39 years of age, who, despite the absence of a positive history, had almost certainly had syphilis (positive Wassermann reaction), there developed during a period of nine months before death a symmetrical bilateral spastic paresis associated with extensive muscular wasting and evidence of disease of the dorsal columns of the spinal cord—loss of the sense of position, &c. He also presented progressive mental deterioration, small and irregular pupils which reacted sluggishly or not at all to light, sphincter trouble, dysarthria, and dysphagia. The post-mortem examination of the nervous system revealed chronic syphilitic leptomeningitis over the brain, with but little change in the cerebral cortex, a combined degeneration of the dorsal and lateral columns of the spinal cord, and a primary atrophy of the motor cells of the ventral horns.

In the ventro-lateral columns the disease involved both the crossed and direct pyramidal tracts, and presented the characters of a true system degeneration, as it was only the fibres of these tracts that were involved, and their distal portions were evidently affected earliest and most severely. In the dorsal columns the disease was also systemic; it is true it involved the cornu-commissural zone in some regions, but as Collier and Buzzard and others have shown, this region contains exogenous fibres. It was not due to degeneration in bulk of the dorsal roots, but apparently picked out certain systems of fibres contained in them, and especially those which ascend in the dorso-median columns. Further, the degeneration of these fibres, as that of the pyramidal tracts, increased in the ascending direction, that is, away from their trophic cells. The degeneration in the ventral horns was also selective, as the cordonal and commissural fibres that spring

from them were spared, though there was severe disease of their motor radicular cells.

The degeneration in the intra-medullary portion of one trigeminus root was probably only a chance occurrence and unrelated to the disease; it was slight, and was such as is known to occur in various marasmic states. Schuster has seen it in amyotrophic lateral sclerosis.

In attempting to determine the nature of the disease it must be admitted, in the first place, that it was syphilitic; the positive Wassermann reaction in the serum, the presence of small pupils reacting poorly to light, and the histological character of the cerebral meningitis are all strong evidence in favour of this view.

When he was first seen as an out-patient the association of progressive muscular wasting and a spastic paresis with irregular and sluggishly reacting pupils and mental dulness suggested the diagnosis of a combination of amyotrophic lateral sclerosis and general paralysis of the insane, but while he was under observation this diagnosis became less probable. And the histological examination of the nervous system threw further doubt upon it. It is true the affection of the ventral horns was similar to that found in amyotrophic lateral sclerosis, but in this disease the degeneration of the ventro-lateral columns, as I have recently emphasised, always extends beyond the areas occupied by the cortico-spinal fibres, and the degeneration of these can be in almost every case traced to the cerebral cortex. The spino-cerebellar tracts, too, which are so frequently affected in amyotrophic lateral sclerosis, escaped in this case. Degeneration of the dorsal column has been described in this disease by Charcot and Marie, Oppenheim, Schuster and others, but it has been always slight, and in no way resembled that in my case. It may be mentioned that pupillary disturbances are occasionally seen with other symptoms that suggest amyotrophic lateral sclerosis, and this diagnosis has been confirmed post-mortem in such cases by Schlesinger and Probst.

It is much more difficult to dismiss the diagnosis of general paralysis of the insane on both clinical and pathological grounds. The poorly reacting pupils and the tremulousness of the lips and tongue belong to the physical symptoms of this disease, but apart from a primary progressive dementia the case presented no characteristic mental symptoms. On the pathological side the relatively little disease in the cerebral cortex is not in favour of

it, and such as was present is what might be expected to result from the syphilitic leptomeningitis. Further, the cortical disease, or the disturbance of cortical function secondary to the leptomeningitis, would account for the mental deterioration. It is well known that such pupillary disturbances as this case presented occur in cerebral syphilis as well as in general paralysis and tabes. The dysarthria and dysphagia may be attributed to the bilateral spastic state, or perhaps to early bulbar disease.

Another question to be considered is if the degeneration of the dorsal columns is tabetic. I believe this question must be answered in the negative, although on superficial examination the lesions of the dorsal columns resemble those of tabes dorsalis. On the other hand, the facts that the dorsal roots are normal or almost so, even in regions in which the disease is most intense, and that Lissauer's zones escape, are strong evidence against tabes. Further, there is not the same amount of loss of myelinated fibres in the dorsal horns and in Clarke's columns that would be found with tabetic degeneration of the dorsal columns of this severity.

With the pseudo-systemic combined degenerations—subacute combined degeneration and that form that occurs in pernicious anæmia—the case presented neither clinical nor pathological resemblances, as the disease, especially in the ventro-lateral columns, was restricted to certain tracts of fibres, and was not, as it is in these cases, irregular and diffuse.

From these facts I am inclined to regard the case as a true combined systemic degeneration of the dorsal columns of the cord and of the cortico-spinal and spino-muscular neurones, which developed on a syphilitic, or more probably on a parasymphilitic basis, and only by its ætiology related to the more common post-symphilitic diseases, tabes dorsalis and general paralysis of the insane.

It will be interesting to refer now to other recorded cases in which muscular atrophy was associated with combined degeneration of the cord.

In 1898 Pal described an amyotrophic type of combined degeneration ("Amyotrophisch-paretische Forme der kombinierten Erkrankungen von Nervenbahnen—sogennante primäre kombinierte Systemerkrankung"), and in his own case the symptoms resembled somewhat those of the case described above. A woman, 45 years of age, in whom there was no suspicion of syphilis, com-



plained first of weakness of the left lower limb, later of the left arm, and within six months all limbs were weak and wasted; the proximal muscles were more affected than the distal. The pupils were normal, but incontinence developed, and there was some loss of sensibility to pain. The illness lasted nine months. The pathological changes were, however, completely different from those in my case, as there was diffuse degeneration in the ventro-lateral columns, greatest in the areas of the pyramidal tracts, very similar to that which characterises amyotrophic lateral sclerosis; in the dorsal columns there was very little disease and practically no ascending degeneration.

Mayer has also published a case which Strümpell has referred to as post-syphilitic system disease. About eight years after syphilitic infection the patient complained of pains in one leg, disturbance of gait, and sphincter trouble. Two years later there was spastic paresis of all limbs, with exaggerated reflexes, Argyll-Robertson pupils, and dysarthria. Next year the spasticity had diminished, the knee-jerks were feeble, and mental deterioration had set in. Post-mortem examination revealed systemic degeneration of the pyramidal and spino-cerebellar tracts as well as of the dorsal columns, and extreme atrophy of the cells of the ventral horns, of Clarke's column, and of the bulbar motor nuclei. In this case the spastic symptoms predominated over the atrophic till towards the end of the illness. The chief pathological difference from the case reported here was the degeneration of the spino-cerebellar tracts.

Sioli reports the case of a man who in 1874 had palsy of all four limbs and sensory disturbances following a severe spinal injury, from which he recovered completely. Five years later there developed gradually progressive weakness of the legs and dementia; the lower limbs were wasted and the electrical reactions of their muscles diminished, the arms were weak, the knee-jerks absent, and the pupils were unequal but reacted. He afterwards found intense degeneration of the pyramidal and direct cerebellar tracts, but in the upper dorsal segments the disease of the ventro-lateral columns was more extensive. The dorsal columns were severely affected in the lumbar region, but in the higher segments there was chiefly ascending degeneration. The ventral horn cells were also diminished in number.

Von Leyden, in his text-book on "Diseases of the Spinal Cord,"

refers to a similar case in which the symptoms set in six years after syphilitic infection. The course of the illness was irregular and intermittent; but the patient eventually presented great weakness and wasting of the limbs, dysarthria, and mental disturbance. There was advanced degeneration of the pyramidal tracts and some diffuse affection of the rest of the ventro-lateral columns, though it appears from the illustration that the direct cerebellar tracts escaped. In the dorsal columns the degeneration fell chiefly on the columns of Goll. The ventral roots and ventral horn cells were atrophied.

In Henneberg's case the illness began with weakness and pain in the lower limbs, bulbar symptoms, and general wasting of the muscles of the legs and hands. The course was very slowly progressive, but seven years later had advanced to almost complete atrophic palsy of the legs; there was also weakness of the lips, tongue, and palate, and of the external recti muscles. He had also lancinating pains, absent knee-jerks, extensor responses, sphincter trouble, slight anæsthesia, and much loss of the sense of position. The pupils were normal, but the mental state had deteriorated to a moderate dementia. Histological examination showed degeneration of the pyramidal tracts which diminished cerebralwards, and of the direct cerebellar tracts and the dorsal columns. In the lumbar region it was chiefly the dorso-median and middle root zones of the latter that were affected, while in the dorsal segments almost the whole of the columns were involved, including the ventral zone. The extra-medullary portions of the dorsal roots and Lissauer's tracts were unaffected. There was also extensive atrophy of the cells of the ventral horns, of the bulbar motor nuclei, and of Clarke's column.

On comparing these cases with that which I record here it will be seen that those reported by Sioli, Mayer, Henneberg, and perhaps von Leyden's, offer considerable clinical and pathological resemblances. In all there were symptoms of a combined spinal degeneration associated with extreme muscular wasting, and in all four there was progressive mental deterioration. In one Argyll-Robertson's sign was present, and in another the pupils were unequal but they reacted to light. Further, the illness followed syphilitic infection in Mayer's and von Leyden's cases, but there was no history of it in the other two.

The spinal lesions in these cases also resembled those of my

case, the most prominent difference being degeneration of the direct cerebellar tracts in the cases of Mayer, Sioli, and Henneberg, and possibly in von Leyden's case too. There were, however, certain differences in the type of the disease of the dorsal columns, which possibly depended in part at least on the stage of the disease in which the examination was made.

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## Abstracts

## ANATOMY.

**HISTOLOGY OF THE SENSORY GANGLIA OF BIRDS.** E. VICTOR  
(59) SMITH, *Amer. Journ. of Anat.*, Vol. xiv., No. 2, Jan. 15, 1913, pp. 251-282 (40 figs.).

THE material used in this important study consisted of the spinal ganglia and the 5th, 9th, and 10th cranial ganglia of the chick, duck, goose, and pigeon; spinal, 5th, 8th, 10th cranial of screech

owl; 5th, 9th, and 10th cranial of turkey; and spinal sensory ganglia of the sparrow. The fixatives were ammoniacal alcohol and 5 per cent. formalin: staining was by Cajal's silver reduction method mainly: the ganglia of old birds stained more readily than those of younger ones. The following is a shortened account of the author's long summary: (1) The sensory ganglia of birds vary in size somewhat in proportion to size of bird. In individuals the Gasserian is the largest, then come the brachial, vagus, lumbosacral, the other spinal, and last, the glosso-pharyngeal. The brachial ganglia are relatively large in birds that use their wings much. (2) In the larger ganglia the cells are most numerous about the periphery; the smaller ganglia show no definite cell-groupings. (3) The size of the ganglion cells is in a measure proportional to size of bird. The cells of each ganglion usually vary considerably in size. (4) In the brachial ganglia of owl and mallard duck the cells form two classes, large and small: the large are much the less numerous. (5) The larger nuclei are usually found in the larger cells. In the small birds the nuclei are larger in proportion to size of cells than in large birds. (6) The cells are usually rounded or elliptical: a few are pyriform, club-shaped, or irregular: irregularities are commoner in older birds. Lobulated cells (well figured) are common in the 5th and 10th cranial of owl, and less common in the same ganglia of mallard duck. (7) In adults unipolar cells predominate: their peripheral branch is the larger. (8) In embryos the cells are bipolar: they begin as oppositi-polar, and show gradations up to the unipolar condition; in chick-embryos many intermediate forms are present. (9) Initial glomeruli and implantation cones are infrequent, except in 5th and 10th cranial ganglia of owl. (10) The Gasserian of the chick shows a remarkable coiling of the central axis of the peripheral process, the sheath not being affected. (11) The ganglion cells of the old hen show many vacuoles, and a less plump condition than those of younger fowls: they show also a larger number of protoplasmic slings and fenestrations: the latter are complicated in old hens, simple in younger ones. (12) Fine accessory processes, terminating within the capsule, some with and some without end enlargements, are present in the Gasserian of the old hen, and less frequently in owl and other birds. (13) Pericellular networks are especially well seen in the vagus ganglion of the old hen, and also of owl. (14) The chick's Gasserian cells show a close-meshed, perinuclear network. (15) The sensory ganglion cells of birds are surrounded by connective-tissue sheaths, in which are elliptically-shaped nuclei: these are specially numerous in goose and duck; the ganglia show also very many mantle-like nuclei in the intercellular spaces. (16) No true multipolar cells were observed in the sensory ganglia. (17) All the ganglia studied showed non-medul-

lated fibres from the sympathetic; sometimes the fibres could be traced to pericellular networks.

The author gives brief comments on the literature of the vertebrate sensory ganglia, and "specially considers the salient points of eleven important publications on those of birds." His figures are excellent.

LEONARD J. KIDD.

**THE DEVELOPMENT OF THE PROOTIC HEAD SOMITES AND (60) EYE MUSCLES IN *CHELYDRA SERPENTINA*.** C. E. JOHNSON, *Amer. Journ. of Anat.*, Vol. 14, No. 2, Jan. 15, 1913, pp. 119-186 (24 figs.).

APART from its intrinsic value, this paper is of special interest in that the only previous work on the development of the head somites of *Chelonia* known to the author is that of Filatoff (1907) on *Emys lutaria*. The latter paper and that of Corning (1900) contain the most complete account previously published on the development of the eye muscles of reptiles. The present paper has, among its figures, many excellent drawings of wax reconstruction models. The youngest embryo studied was one of 2 mm. with 5 segments, but it showed no differentiation of the dorsal mesoderm in the prootic region which might indicate a possible somite area. But in the next stage studied, that of a 3.5 mm. embryo (10 segments), such differentiation was evident. For the development of the head somites the stages studied ranged from this one up to one of 8 mm.; for the development of the eye muscles, stages from one of 9 mm. up to one of an embryo with a carapace length of 8.5 mm. The author uses the convenient terms oculomotor, trochlear, and abducent muscles to denote the muscles supplied by the third, fourth, and sixth nerves respectively.

#### *A.—The Head Somites.*

(1) The first (pre-mandibular) prootic head cavity or somite arises as a lateral outgrowth from the antero-dorsal wall of the foregut: after certain later changes, fully described, it will give rise to the anlage of the oculomotor muscles. (2) The second (mandibular) somite arises in the dorsal mesoderm at the side of the neural tube, just below and slightly anterior to where the trigeminal ganglion later appears; it forms later the anlage of the trochlear muscles: part of this muscle-mass is closely associated with the maxillo-mandibular musculature, and probably undergoes regression later: the remainder becomes later the superior oblique muscle. (3) The third (hyoid) somite arises in the dorsal mesoderm, close to the ventro-lateral side of the hind-brain, between the location of the facio-acoustic and the trigeminal ganglia, but nearer the latter.

*B.—The Eye Muscles.*

(1) The first to be laid down are the abducent muscles: but the retractor oculi is the last eye muscle to reach its definite adult position. The Nervus Abducens first appears in the 9 mm. stage, but is not connected with its muscles till the 10 mm. stage. (2) The musculus obliquus superior grows forward as a stream of cells from the dorsal portion of the mesenchymal cell-mass which results from the second head somite. It remains connected for a long time with the ventral portion of that mass: later it separates from it, and its insertion to the globe is effected soon after the 11 mm. stage. The Nervus Trochlearis reaches the muscle relatively late, *i.e.*, shortly after the 11 mm. stage. (3) Of the oculomotor muscles the first to appear is the Obliquus Inferior (9 mm. stage), but it is the last to receive its nerve supply. The Rectus Superior arises soon after it. The Rectus Inferior and Medialis (Internus) are the last of the eye muscles to begin their development: they arise from a common anlage in the 10 mm. stage, and each receives its nerve branch in the 11 mm. stage.

In connection with the origin of the sixth and third nerves, Johnson points out that in *Chelydra* (the snapping turtle) the sixth nerve does not arise in continuity with the developing muscles as Filatoff claims for *Emys*: its connection with the muscles is effected later than its origin from the brain. So, too, the third nerve, when first found in *Chelydra*, has no connection with the first head somite, but could be readily followed to the neural tube. In the 10 mm. stage, where the ciliary ganglion appears as an accumulation of cells at the distal end of the third nerve, that nerve has still no connection with its muscles: but at the 11 mm. stage it extends beyond the ciliary ganglion, and connects with the superior, inferior, and medial recti muscles. Later it connects with the inferior oblique muscle, and eventually becomes separated from the ciliary ganglion except for a branch which forms the radix brevis of that ganglion.

LEONARD J. KIDD.

**CHROMAFFIN ELEMENTS IN THE CARDIO-CERVICAL REGION**

(61) **OF CERTAIN LIZARDS.** (*Éléments chromaffins dans la région cardio-cervicale de quelques sauriens.*) L. DE GAETANI, *Arch. Ital. de Biol.*, lviii., F. 1, Nov. 15, 1912, p. 28.

TRINCI has recently described a cardiac and a carotid paraganglion in reptiles (*Monit. Zool. Ital.*, xx., 1909). De Gaetani has made a careful study of the cardiac and cervical regions of *Lacerta viridis* and *muralis*. Some of his material was fixed with absolute alcohol, and stained with thionine; some with Wiesel's mixture (10 parts of KBr 5 per cent., 20 parts of formalin 10 per cent., 20 parts

distilled water), and stained with toluidine blue and safranin, or with hæmatoxylin Delafield and eosin. He finds in lizards a cardiac paraganglion in the form of diffuse groups of chromaffin cells in the intra-pericardial portion of the walls of the arteries, and disseminated groups in the neighbouring connective tissues. The carotid paraganglion is in the region of the bifurcation of the common carotid artery, and clearly forms a connecting link with the carotid gland of birds and mammals. Chromaffin elements are also present, either isolated, or in small groups disseminated in the cardiac and cervical regions, and are in relation with the vascular walls and possibly with the ramifications of the sympathetic: these chromaffin cells are of various shapes—oval, rounded, or sometimes elongated: they are enclosed in the adventitia of the vessels: in size they resemble erythrocytes. Phaeochrome cells are enclosed within the intimate structure of the cardiac nerve-ganglia. The writer points out that his observations correspond almost entirely with the most recent work of Trinci on the cardio-cervical chromaffin system of lizards (*Arch. Ital. di Anat. e. di Embryol.*, x., Feb. 15, 1912).

LEONARD J. KIDD.

**THE ARTERIAL LESION IN CASES OF "CERVICAL" RIB.**

(62) T. WINGATE TODD, *Journ. Anat. and Physiol.*, Vol. xlvii., Jan. 1913, p. 250.

THE vascular symptoms occurring in cases of so-called cervical rib are not mechanical in origin, but are trophic in character and are caused by paralysis of the sympathetic fibres passing to the vessels. The same nerve which supplies the skin and muscles supplies the vessels, and hence trophic changes occur in the same area in either vessels or muscles or skin.

A. NINIAN BRUCE.

**ABNORMAL CRANIA — ACHONDROPLASTIC AND ACRO-**

(63) **CEPHALIC.** ARTHUR KEITH, *Journ. Anat. and Physiol.*, Vol. xlvii., Jan. 1913, p. 189.

IN this paper it is pointed out that the main lesion in achondroplasia, so far as pertains to the skull, is an arrested growth of the bones entering into the formation of its posterior fossa. The nature of the arrest is due to a passive condition of the cartilage cells bordering the line of ossific growth. The passive behaviour of the cartilage cells is probably due to the absence of an element secreted by one of the ductless glands.

In contrast to the cranial form seen in achondroplasia are the conditions described here as opisthocephaly and acrocephaly. All the facts of abnormal cranial forms cannot be satisfactorily explained by postulating any abnormal development of the amnion

or of amniotic pressure, they can only be explained by supposing there is a disturbance of those factors which regulate growth: so far as we know these are the internal secretions or hormones.

A. NINIAN BRUCE.

## PHYSIOLOGY.

### DEGENERATION AND REGENERATION OF NERVE FIBRES.

(64) S. WALTER RANSON, *Jour. of Comp. Neurol.*, Vol., xxii. No. 6, Dec. 15, 1912, pp. 487-546 (29 figs.).

THIS paper is based on experiments in which the sciatic nerve of adult dogs was divided in the upper part of the thigh: in some cases the ends were allowed to retract: in others a stretch of 1 cm. was removed and retraction allowed: in others, without resection of any of the nerve, the two ends were approximated with sutures. The dogs were kept for from one to thirty-five days: at autopsy a short stretch of the proximal stump, and a longer stretch of the distal stump, together with the intervening scar, was removed. The pyridine-silver modification of Cajal's method was used. Ranson gives the results in detail under the following headings:—

#### *A.—Early Changes in the Distal Stump.*

1. Degeneration of the medullated and the non-medullated fibres, and in each case formation of nucleated protoplasmic bands; these changes were studied at a distance of at least 5 mm. from the cut surface.

2. Abortive autogenous regeneration occurs in the immediate neighbourhood of the cut surface: both medullated and non-medullated fibres are thus affected: it occurs very early, so that it is well advanced in both kinds of fibres one day after operation: but many fibres do not show regenerative changes, but undergo an uncomplicated degeneration throughout their entire extent. Ranson looks on these as probably the more susceptible fibres: they are well advanced in degeneration by the fourth day: "the more resistant is the fibre, the greater is the reaction near the lesion, and the slower the fragmentation of the remainder of the distal stretch."

#### *B.—Early Changes in the Proximal Stump.*

Changes in the axons can be noticed within twenty-four hours after the lesion. They consist of the formation of fine branches, and the re-arrangement of the neuro-fibrils of the old axons to form the most complicated networks. These changes are limited



to the immediate neighbourhood of the cut surface, and "are too varied to summarise in detail." These were also seen by Perroncito, and confirmed by others who have used the Cajal technique.

1. The changes in the non-medullated fibres comprise (a) early abortive regeneration; (b) cellulipetal (retrograde) degeneration; (c) formation of new axons.

2. The changes in the medullated fibres are: (a) formation of a zone of reaction; (b) fibrillar dissociation; (c) early branching of the axons close to the lesion; (d) formation of lateral branches at some distance above the lesion; (e) formation of fibre-bundles and skeins.

*C.—Mechanism of Regeneration of Nerve Fibres.*

(1) Proliferation of axons in central stump: can be seen within twenty-four hours after the lesion. (2) Penetration of the new axons through the scar. (3) Utilisation of the protoplasmic bands as pathways for the new axons in the distal stump.

Ranson found that while the majority of the non-medullated fibres in the distal stump degenerate very early, a few such, which he believes to be sympathetic fibres, may persist for two or three weeks, but they all undergo degeneration before the end of the fourth week. He shows that "that portion of a fibre which is separated from its tropic centre does not die at once. It continues to live for two or three days, and possesses sufficient vitality to cause a re-arrangement of its fibrils into a complicated reticulum, and to give rise to lateral branches." He has convinced himself that all the nerve-fibres in the scar are outgrowths of central axons. "No cases were studied in which sufficient time had elapsed for complete regeneration of the nerve. He expects to make other experiments on young dogs to determine the structure of a fully regenerated nerve, and especially the relative proportion of medullated and non-medullated axons which it contains."

LEONARD J. KIDD.

**CONTRIBUTIONS TO THE HISTO-CHEMISTRY OF NERVE: ON**

(65) **THE NATURE OF WALLERIAN DEGENERATION.** HENRY O. FEISS and W. CRAMER, *Proc. Roy. Soc., Series B*, Vol. 86, No. 8585, Feb. 7, 1913, p. 119.

CATS' nerves removed from the body and kept at body temperature in Ringer's solution or in blood serum exhibit certain changes in the myelin sheath as studied in osmic acid preparations, which resemble the early changes exhibited by nerves degenerated for about equal lengths of time in the living. These changes are slowed but not inhibited by lower temperatures. In nerves kept

in liquid paraffin, the changes are not seen to occur to any great extent. There is one difference in the appearance of nerves degenerated *in vivo* from that of nerves kept *in vitro*: the broken-down myelin stains less clearly in the latter condition, and thus has a flaky appearance. This same flaky staining was noted in the living when the circulation of a nerve was cut off locally.

AUTHORS' ABSTRACT.

**ON THE ACTION OF INTRAVENOUS INJECTIONS OF SALINE  
(66) EXTRACT OF CHOROID PLEXUSES ON THE BLOOD-PRESSURE AND FORMATION OF CEREBRO-SPINAL FLUID.**

(Sopra l'azione delle iniezioni endovenose di estratto salino di plessi coroidi sulla pressione sanguigna e sulla formazione del liquido cefalo-rachidiano.) N. DEL PRIORE, *Riv. ital. di Neuropat., Psichiatr., ed Elettrotet.*, 1912, v., p. 494.

A RECORD of experiments on dogs, the results of which agreed with those of Halliburton (*v. Review*, 1911, ix., p. 504). The injections were not toxic for the animals and were always followed by a fall of blood-pressure. In the dogs in which a cerebro-spinal fistula was made, fall of blood-pressure always accompanied the first injection and rarely the succeeding ones. J. D. ROLLESTON.

**THE ACTION OF THE VAGUS ON THE HUMAN HEART. W. T.  
(67) RITCHIE, *Quart. Journ. Med.*, 1912, vi., p. 47.**

COMPRESSION of the right vagus may depress the rate and strength of the auricular beats, may prolong auricular systole, and may depress the conductivity of the auriculo-ventricular bundle system. The inhibitory effects ensue gradually, and usually pass off gradually while compression of the nerve is still being maintained. Compression of the right vagus did not depress the excitability of the auricular muscle when in fibrillation or in flutter. In cases of complete auriculo-ventricular dissociation, the vagi had no apparent influence on the ventricles. In hearts with a normal rhythm, however, vagus compression may depress the rate and contractility of the ventricles, and in rare instances may prolong the duration of ventricular systole. The depression of ventricular rate is usually proportionate to the degree of auricular retardation.

In some instances the auricles escape from vagus inhibition before the ventricles; in others ventricular standstill may terminate by the occurrence of idio-ventricular beats. The inhibitory effects of left vagus compression are usually less effective than those of right vagus compression, and the latter are almost uniformly the reverse of those induced by atropin. AUTHOR'S ABSTRACT.

**THE ACTION OF ADRENALIN, PARAGANGLIN, AND HYPOPHYSIN ON THE KIDNEY.** (68) *(Action de l'adrénaline, de la paragangline, et de l'hypophysine sur le rein.)* P. PENTIMALLI and N. QUERCIA, *Arch. Ital. de Biol.*, lviii, F. 1, Nov. 15, 1912, p. 33.

THESE experiments were performed on the isolated kidneys of dogs and rabbits by Sollmann's method of artificial circulation, which has the great advantage that a constant pressure of the fluid circulating in the kidney is always maintained. The records of eight experiments are given: the writers mention that they failed to find any published work on the influence of paraganglin on the kidneys. *Conclusions*—(1) Adrenalin and also paraganglin and hypophysin have a strong vaso-constrictor action on the kidney; in the case of adrenalin, if the dose be sufficiently large, the circulation in the kidney is entirely arrested; the writers thus confirm Jonescu's opinion that it exercises almost a specific action on the renal vessels. (2) The vaso-constriction, if it be not excessive, begins to diminish at the end of a certain time, even though the fluid containing the vaso-constrictor substances continues to circulate in the kidney. The return of the vessels to the primary condition may be interpreted as a fatigue phenomenon of the muscle cells and fibres. (3) Glomerular filtration behaves in a similar fashion; when vaso-constriction is marked, the fluid ceases to traverse the glomeruli: when it diminishes, filtration is restored. (4) Of these three substances tested, hypophysin, while it produces vaso-constriction, seems to have the least influence on renal secretion. (5) These three substances have no diuretic action; if sometimes diuresis occurs, it is probably due to increase of blood-pressure; one cannot therefore believe that they have a stimulant action on the kidney. (6) The results obtained with adrenalin agree with the hypothesis of Schur and Wiesel that certain forms of nephritis depend on hyper-production of adrenalin; one can understand that the marked and protracted renal vaso-constriction caused by the circulation in the blood of an excess of adrenalin may set up grave functional and anatomical renal changes.

LEONARD J. KIDD.

## PATHOLOGY.

**GENERAL PARALYSIS WITH AMYLOID DEGENERATION OF THE BRAIN.** (69) *(Paralysie générale avec dégénérescence amyloïde du cerveau.)* MIGNOT and MARCHAND, *L'Encéphale*, June 10, 1912, p. 497.

APPARENTLY this is the first case on record in which amyloid degeneration of the brain has been recorded. It has been observed in the ganglia of the sympathetic system. In the present instance

this special form of degeneration ensued on the chronic inflammation of a diffuse meningo-encephalitis. The change commenced round the blood vessels, and spread through all the cortex, forming irregular plaques. Only the grey matter was involved. There was no neuroglial reaction in the neighbourhood of the degenerated areas. Nerve cells and fibres atrophied and disappeared as the process advanced.

S. A. K. WILSON.

**SYRINGOMYELIA WITH HYPERPLASIA OF THE CONNECTIVE TISSUE AND WITH STRIPED MUSCLE FIBRES IN THE CORD.** (*Syringomyélie, hyperplasie du tissu conjonctif, fibres musculaires striées dans la moelle.*) ANDRÉ THOMAS and QUEROY, *Nouv. Icon. de la Salpêtrière*, Sept.-Oct. 1912, p. 364.

THIS case, described in great detail, is worthy of notice for several reasons. In the central part of the cord was a gliomatous formation through almost the whole of its vertical extent. The glioma was excavated, and its cavity lined by a thick carpeting of connective tissue, which was directly continuous with the thickened meninges along several lines. The central canal was replaced by scattered ependymal cells, in some places massed together. At one or two levels there was no anterior commissure, and the cavity was directly continuous with the anterior median fissure. Above all, scattered throughout the cavity, or embedded in its diverticula, were unmistakable cross-striated muscle fibres, which are well reproduced in photographs.

The authors provide an interesting discussion on the presumed embryonic origin (from mesodermic myotomes) of these fibres at a very early stage in foetal development. They also emphasise the sclerotic nature of the syringomyelia, and attribute to the gliomatous formation a secondary importance.

S. A. K. WILSON.

**THE IDEAL LESION PRODUCED BY JUDICIAL HANGING.** (71) F. WOOD-JONES, *Lancet*, Jan. 4, 1913, p. 53.

FROM a series of five sets of cervical vertebræ the author found that the odontoid process played no part in producing death, but that the posterior arch of the axis was snapped clean off and remained fixed to the third vertebra, while the atlas, odontoid process, and anterior arch of the axis remained fixed to the skull. This lesion is produced by the violent jerk which throws the man's head suddenly backwards and snaps his axis vertebra. Death is instantaneous, as the spinal cord is completely severed by the fracture of the neck.

A. NINIAN BRUCE.

## CLINICAL NEUROLOGY.

**THE MECHANISM OF KERNIG'S SIGN AND OF NÉRI'S SIGN.**(72) NOICA, PAULIAN, and SULICA, *L'Encéphale*, Aug. 10, 1912, p. 118.

THE authors conclude that Néri's sign and Kernig's sign are identical, and that the phenomenon—flexion of the knee—is a movement of defence provoked by forced extension of the tendons of the hamstrings in patients whose sensibility to movements of defence is pathologically increased.

S. A. K. WILSON.

**THE ASSOCIATIONS OF TUBERCULOSIS WITH DISORDERS OF**(73) **THE NERVOUS SYSTEM.** A. J. WHITING, *Practitioner*, Vol. xc., Jan. 1913, p. 269.

THE author divides tuberculous disease of the nervous system into two groups: (1) a larger, in which the mechanical factor is predominant, and (2) a smaller, in which the toxic factor is more important. The toxic effects may be subdivided further into those affecting: (a) the higher brain centres, causing psychical changes of optimism or depression, (b) the middle level centres producing epileptiform or tetanoid spasms, (c) the lower or bulbar centres, leading to tachycardia, dyspnoea, and vasomotor changes, (d) the spinal cord, causing myoidema and muscular wasting, and (e) the nerves, resulting in changes in motor power, sensibility, and in the reflexes.

A brief discussion then follows, attention being specially paid to tuberculous meningitis.

A. NINIAN BRUCE.

**INTERCOSTAL ZOSTER IN TABES. (Zona intercostal chez une**(74) **tabétique.)** DESQUEROUX, *Jour. de Méd. de Bordeaux*, 1912, xlii., p. 771.

A CASE of typical herpes zoster in a tabetic woman, aged 42. Desqueroux regarded it as an instance of true zoster, and not of a zosteriform eruption in tabes. The future history would decide the question, the absence of any recurrence indicating true zoster.

J. D. ROLLESTON.

**SYMMETRICAL PURPURA OF LEFT ARM AND ZOSTER OF**(75) **RIGHT ARM. (Purpura radicaire du bras gauche et zona du bras droit symétriques.)** H. GOUGEROT and THIBAUT, *Arch. d. mal. d. cœur, d. vaiss. et d. sang.*, 1912, v., p. 726.

THE patient was a man, aged 29, with advanced pulmonary tuberculosis, in which lesions predominated at the right apex,

and commencing tuberculous peritonitis with probable hepatic involvement. The purpuric diathesis had already been manifested by the appearance of a few purpuric spots on the lower limbs, when zoster of the right arm developed, occupying the area of the fifth and sixth cervical roots. Four days after the onset of the zoster a purpuric eruption with a few abortive herpetic lesions appeared on the left arm, with the same distribution as the zoster on the right arm.

The case presents the following features of interest:—

1. It illustrates the frequency of purpura in tuberculous subjects (*v. Review*, 1912, x., p. 232).

2. It illustrates the frequency of zoster in the tuberculous, though it cannot be regarded as an argument in favour of the tuberculous nature of herpes zoster. Everything, on the contrary, proves that this is an instance of a specific infection being superimposed upon tuberculosis.

3. It confirms the views of Gougerot and Jalin (*v. Review*, 1911, ix., p. 25) adopted by Minet (*ibid.*, 1912, x., p. 133) on herpetic immunisation.

4. It illustrates the relation between zoster and purpura, purpura replacing herpes in the area affected by abortive zoster.

J. D. ROLLESTON.

**ON THE ETIOLOGY OF TABETIC ARTHROPATHIES.** (Ueber (76) *die Aetiologie der tabischen Arthropathien.*) K. STARGARDT, *Arch. f. Psychiat.*, Bd. 49, H. 3, 1912.

THE author reports the clinical history and pathological examination of a case of tabetic arthropathy which came under his own observation. He emphasises the presence of a localised inflammatory process in the synovial membrane with the presence of plasma cells and lymphocytes. He concludes that there is a chronic non-gummatous syphilitic process at the basis of the tabetic arthropathies, and rejects the theories of a trophic origin.

C. MACFIE CAMPBELL.

**ACUTE SYPHILITIC MENINGO-ENCEPHALITIS IN TABES.** (77) (*La méningo-encéphalite syphilitique aiguë des tabétiques.*) CLAUDE, *L'Encéphale*, Ann. vii., No. 12, Dec. 10, 1912, p. 417.

MENTAL symptoms supervening in the course of tabes have not infrequently been described. Occasionally it has been clear that these have not been due to an incipient general paralysis, but have been associated with a more purely syphilitic process. The effort has also been made to differentiate the actual type of psychosis from the ordinary type of dementia paralytica. The author

reports a fresh instance, which is well worked out, both clinically and pathologically. In a typical case of tabes, of some four years' duration, there was an "attack" without loss of consciousness, in which the patient was seized with general trembling, weakness, giddiness, and inability to stand. Some three days later his behaviour was observed to have more or less suddenly become eccentric: he began to collect matches and wooden boxes and to glue them together, for "inventions" which one day his family would see, &c. This mental state lasted for, at the most, five days. About ten months later he began to get agitated, to suffer from ideas of culpability, persecution, &c.: he became depressed and occupied with suicidal ideas. During the fortnight before his death there were alternations of excitement, with agitation and polymorphic delusions.

The cord was typical of tabes. A very minute examination of the brain was made, and the following lesions noted:—

(1) Sclero-gummatous nodule, a single small isolated specimen, at the posterior end of the second right frontal convolution.

(2) Old meningeal thickenings and adhesions, mostly frontal, small in dimensions and very localised.

(3) Foci of subcortical hæmorrhagic softening, in definite association with arterial lesions and accompanied by inflammatory reactions in the immediate neighbourhood, contrasting with the integrity of the rest of the brain substance.

(4) Circumscribed foci of œdematous encephalitis, with inflammatory reaction but no necrosis.

All these lesions were notably limited, whereas the great mass of the encephalon showed no meningeal reaction, no defect of cortical cells, no vascular alterations; in short, none of the signs of general paralysis. The diagnosis was syphilitic meningo-encephalitis, with encephalomalacia from syphilitic endarteritis. The clinical symptoms, mental in nature and coming in "attacks," may be regarded as analogous to the motor central phenomena seen in tabes, *e.g.*, hemiplegia.

S. A. K. WILSON.

#### **PSEUDOMENINGOCOCCUS AND PARAMENINGOCOCCUS MENINGITIS.**

(78) **GITIS.** (*Méningites à pseudoméningocoques et à paraméningocoques.*) A. R. DUJARRIC DE LA RIVIÈRE, *Thèses de Paris*, 1912-13, No. 86.

A BACTERIOLOGICAL and clinical study of pseudo-meningococcus and parameningococcus meningitis. Under the former are included cases due to *Diplococcus crassus*, *D. siccus*, *D. flavus*, gonococcus, and the polymorphous coccus recently described by Chevreil and Bourdinière (*v. Review*, 1913, xi., p. 37).

J. D. ROLLESTON.

**PURULENT TYPHOID MENINGITIS. ONSET WITH SYMPTOMS**

(79) **OF ACUTE OTITIS.** (Meningite purulente éberthienne, début par symptômes d'otite aiguë.) H. LEMIERRE and E. JOLTRAIN, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 581.

A MAN, aged 47, suddenly developed symptoms of acute left otitis, rapidly followed by meningitis. The turbid cerebro-spinal fluid yielded a pure culture of typhoid bacilli, which were also found in the blood. Death occurred on the seventh day. Post mortem, suppurative meningitis and the early intestinal lesions of typhoid fever were found.

The writers have found only six similar cases of primary typhoid meningitis. In three (Southard and Richards, *v. Review*, 1909, vii., p. 200; Milligan, and Nieter, *ibid.*, 1908, vi., p. 491) the diagnosis was only made at the necropsy. In the cases of Stühmer (*ibid.*, 1911, ix., p. 267), David and Speik (*ibid.*, p. 326), and Bergé and Weissenbach (*ibid.*, p. 680) the diagnosis was made by lumbar puncture, and the patients recovered. J. D. ROLLESTON.

**GLYCOSURIA IN TUBERCULOUS MENINGITIS.** R. S. FREW and

(80) A. E. GARROD, *Lancet*, Jan. 4, 1913, p. 15.

GLYCOSURIA occurs in about one-third of all cases of tuberculous meningitis, and is most apt to occur during the last days of the patient's life. It probably owes its origin in the cerebral lesion, and belongs to the nervous group, but the authors were not able to determine to what special lesion or other factor its occurrence is due. A. NINIAN BRUCE.

**CASE OF POST-DIPHTHERITIC PARALYSIS AND HEMIPLEGIA.**

(81) L. HUMPHRY, *Proc. Roy. Soc. Med.*, 1911, iv. (Child. Sect.), p. 195.

A BOY, aged 11 years, had diphtheria on December 12, 1909. Dec. 27th, paralysis of palate, weakness of legs, and loss of knee jerks; 29th, left hemiplegia. First seen by Humphry on February 8, 1910, when left hemiplegia of face, tongue, arm and leg was found associated with external strabismus and defective vision of right eye. May 18th, right pupil does not react to light, right optic atrophy. July 1911, patient can walk, some spasticity of left arm and leg, reflexes increased and Babinski on left side; face normal, external strabismus right eye, defective vision and optic atrophy.

The condition was probably due to a clot obstructing the Sylvian artery and the ophthalmic branch. J. D. ROLLESTON.



**HEMIPLEGIA FOLLOWING SCARLET FEVER IN THE PUER-**  
 (82) **PERIUM.** (*Hémiplégie après scarlatine chez une femme en couches.*) ISSAILOVITCH-DUSCIAU, *Presse méd.*, 1912, xx., p. 1025.

A WOMAN, whose age is not stated, gave birth to a healthy child by normal labour. She got up on the ninth day, but on the next she became feverish, and a scarlatinal rash appeared the next day. She had no sore throat. On the third day of disease right hemiplegia and aphasia developed. Gradual improvement occurred, and complete recovery took place within a few months. (The evidence of the disease being scarlet fever is by no means convincing, and the writer is certainly mistaken in attributing a good prognosis to post-scarlatinal hemiplegia (*v. Review*, 1908, vi., p. 530. J. D. R.).) J. D. ROLLESTON.

**HEMIPLEGIA IN TYPHOID FEVER.** J. M. PEARSON, *Canad. Med.*  
 (83) *Assoc. Journ.*, 1912, ii., p. 1120.

A MAN, aged 30, on the fourteenth day of a mild attack of typhoid fever, developed left hemiplegia, followed by some difficulty in swallowing. Death, preceded by repeated intestinal hæmorrhage, occurred on the twenty-fourth day of illness, and on the tenth from the onset of the paralysis.

Necropsy:—Heart normal. Area of softening involving greater part of right second and third frontal, and ascending parietal convolutions, part of supra-marginal and angular gyri, and upper part of temporo-sphenoidal lobe. Thrombosis of right middle cerebral artery. J. D. ROLLESTON.

**PEDUNCULAR AND BULBO-PONTINE SYNDROMES IN TYPHOID**  
 (84) **FEVER.** (*Syndromes pédonculaires et bulbo-protuberantiels au cours de la fièvre typhoïde.*) M. COLLET, *Thèses de Paris*, 1912-13, No. 77.

PEDUNCULAR and bulbo-pontine lesions in typhoid fever are manifested by palsies which sometimes affect isolated nerves of the peduncles, pons, or medulla, or several of these nerves simultaneously. The palsies may be localised to the peduncular and bulbo-pontine regions, but very frequently the bulbo-pontine symptoms may appear in the course of ascending paralysis (*v. Review*, 1906, iv., p. 291), or the peduncles, bulbo-pontine area, and limbs may be affected simultaneously. The pathological anatomy varies, in some cases the nerve centres, in others the nerves, being affected by the typhoid bacillus or its toxins. Peduncular and bulbo-pontine palsies are rare in typhoid fever. Those occurring in the course of the disease are chiefly found in

severe attacks, and are of bad prognosis. Those occurring in convalescence generally end in recovery.

The thesis contains the histories of fourteen cases, including a case of bilateral ophthalmoplegia reported by Lemierre, May, and the writer.  
J. D. ROLLESTON.

**BILATERAL OPHTHALMOPLÉGIA IN TYPHOID FEVER.** (Ophtal-

(85) **moplégie bilatérale au cours d'une fièvre typhoïde.**) A. LEMIERRE, E. MAY, and M. COLLET, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 697.

A GIRL, aged 18, on the forty-seventh day of a severe attack of typhoid fever, was seized with headache, photophobia, and psychical troubles, followed by paralysis first of the right, and five days later of the left, oculomotor nerve. Spontaneous pain was present in the lower limbs with hyperæsthesia of the calf muscles, and loss of knee jerks. Death took place ten days after the onset of the symptoms, the patient having had some difficulty in deglutition two days before death. No necropsy.  
J. D. ROLLESTON.

**OSTEITIS DEFORMANS OF THE CRANIUM SIMULATING**

(86) **HYDROCEPHALUS.** (Ostéite deformans des os du crâne simulant une hydrocéphalie.) J. CARLES and DORÉ, *Gaz. hebdomadaire de médecine et de chirurgie*, 1912, xxxiii., p. 597.

THE cranial deformity followed some cerebral disease of uncertain nature at the age of 8 years. No symptoms of compression resulted, and the condition was mistaken for hydrocephalus. Death due to rupture of an aortic aneurysm occurred at the age of 54, when the condition was found to be an osteitis deformans invading almost all the bones of the skull. The upper part of the orbit was affected with resulting exophthalmus.

J. D. ROLLESTON.

**ON THE PATHOLOGY AND PATHOGENESIS OF PRIMARY**

(87) **CHRONIC HYDROCEPHALUS.** (Pathologie und Pathogenese des primären chronischen Hydrocephalus.) M. S. MARGULIS, *Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

THE author reviews the literature and reports the results of six cases of primary chronic internal hydrocephalus. In addition, four cases of secondary hydrocephalus were examined, two after cerebro-spinal meningitis and two due to pressure in the posterior fossa. The author reports his histopathological findings in considerable detail. The anatomical picture in primary chronic internal hydrocephalus consists in a hyperplasia of the ependyma, in the formation of diverticula and tufts in the ventricle and a

proliferation of the vessel sheaths, and in the formation of a fibrous lamella. The condition is frequently accompanied by syringomyelia which represents merely a different localisation of the same process.

C. MACFIE CAMPBELL.

**TRANSMISSION OF POLIOMYELITIS BY MEANS OF THE**

(88) **STABLE FLY** (*Stomoxys calcitrans*). J. F. ANDERSON and W. H. FROST, *Lancet*, Nov. 30, 1912, p. 1502.

Two monkeys were inoculated intracerebrally with an emulsion of the spinal cord of a monkey which had died from poliomyelitis. These animals were then exposed until death to the bites of several hundred stomoxys for about two hours daily, and three fresh healthy monkeys were exposed daily for about two hours to the bites of these same flies. These three monkeys all developed quite typical symptoms of poliomyelitis seven, eight, and nine days respectively from the date of their first exposure. These experiments confirm those of Rosenau that poliomyelitis may be transmitted to monkeys by means of the stable fly.

A. NINIAN BRUCE.

**MENTAL TORTICOLLIS.** (*Torticollo mentale*.) C. GORIA, *Riv. ital.*

(89) *di Neuropat., Psichiatri. ed Elettrotet.*, 1912, v., p. 482.

A RECORD of a typical case in a man, aged 24, with a review of the literature.

J. D. ROLLESTON.

**THE IMPORTANCE OF GENERAL NUTRITIONAL DISTURBANCES IN THE DETERMINATION OF FACIAL PARALYSIS.**

(90) (Sur l'importance des troubles de la nutrition générale dans le déterminisme de la paralysie faciale.) C. PARHON, *Soc. de Neurol. de Paris*, Nov. 7, 1912, No. xv. (*Revue Neurol.*, No. 22, Nov. 30, 1912, p. 619.)

PARHON has done good service in drawing attention to the need for a study of patients, affected with facial palsy, from the side of general nutritional disturbances, circulatory troubles, and exogenous and endogenous intoxications. He mentions five personal cases of facial palsy in: (1) a young pregnant woman with albuminuria, eclampsia, and blindness; (2) an old woman, a case of facial palsy, "a frigore," who had suffered for many years from excessive anxiety and an hepatic affection; (3) a young woman with badly compensated cardiac disease; (4) a glycosuric woman; (5) a man who showed some signs of thyroid insufficiency (baldness and the eyebrow sign). Parhon draws attention to the recent finding of Marinesco and Minea that thyroidectomy hinders nerve regeneration: this observation has been confirmed by Walter.

Parhon treated his second and his fifth cases with thyroid pastilles and galvanism: both recovered, but case 2 showed the contracture of the orbicularis which is so commonly met with in elderly patients.  
LEONARD J. KIDD.

**SOME RARE MANIFESTATIONS OF PARASYPHILIS OF THE  
(91) NERVOUS SYSTEM.** A. READ WILSON, *Brain*, Vol. xxxv., Part II., 1912, p. 153.

THERE is no doubt that the great majority of cases of tabes and general paralysis of the insane are parasyphilitic nervous diseases. There is evidence that at all events some cases of primary optic atrophy, primary lateral sclerosis, and progressive muscular atrophy are parasyphilitic too. In tabes and general paralysis there is degeneration of certain neuronie tracts or groups; and degeneration of precisely the same character in other neuronie groups produces primary optic atrophy, primary lateral sclerosis, and progressive muscular atrophy. Combinations of all three with tabes or general paralysis of the insane, or with both, or amongst themselves, are so frequent that it is difficult to withstand the conclusion that their essential etiologic factor is the same, more especially since it is conceded that syphilis has a great affinity for the nervous system. If it be allowed that the neuronie degeneration of primary optic atrophy, primary lateral sclerosis, or progressive muscular atrophy, when combined with that of tabes or general paralysis, is due to syphilis, it cannot be denied that such degeneration, occurring uncombined, may still be parasyphilitic. The Argyll-Robertson pupil is recognised as a symptom of tabes and general paralysis, in other words it is a parasyphilitic manifestation. It is found also with primary optic atrophy, primary lateral sclerosis, and progressive muscular atrophy. The author considers that, if the question of antecedent syphilis and Wassermann's reaction were carefully investigated in all cases of primary optic atrophy, primary lateral sclerosis, and progressive muscular atrophy, they would be found to take their rightful place amongst the rarer manifestations of parasyphilis of the nervous system (*cf. Review*, 1912, x., p. 491).  
A. NINIAN BRUCE.

**MOTOR AND SPEECH PARALYSIS DUE TO CEREBRAL ANGIO-  
(92) SPASM.** WILLIAM RUSSELL, *Lancet*, Nov. 16, 1912, p. 1349.

ANGIOSPASM is a spasmodic constriction of vascular channels, no doubt mainly on the arterial side, and may be focal or general. It is most common at or beyond middle life in persons with arterial thickening or atheroma, and not necessarily showing heart feeble-

ness. It usually affects the vessels in or above the internal capsule, producing transient hemiplegia and aphasia. Several cases of this nature are mentioned, and attention is drawn to other similar references from the literature on the subject.

A. NINIAN BRUCE.

**THE PATHS OF ENCEPHALIC INFECTION IN OTITIS.**

(93) CHRISTOPHER TYLOR, *Brain*, Vol. xxxv., Part II., 1912, p. 109.

THIS paper is based upon the post-mortem records of 644 cases of intracephalic infection, including 267 of infective diseases of the ear. Out of 49 cases the pneumococcus was present in 28 and the streptococcus in 9.

Infection through vascular channels appears to be responsible for most cases of lateral sinus thrombosis, while vascular infection is a cause of extradural and brain abscesses in a large number of cases. Many cases of extradural abscess are due to disease of the petrous bone, especially its posterior surface and tegmen; in those cases where the bone is unaffected, the dura mater becomes infected through a septic endophlebitis of a vein of the tympanic mucosa extending to a vein of the dura. Cerebral and cerebellar abscesses may be due to direct contact of the brain with diseased dura mater: if perforation of the latter takes place, direct extension to the cerebral surface may occur; if no perforation occurs, the disease may spread to the brain by infection of the veins in the dura, with extension from them to the vessels of the pia arachnoid, and from the latter to the interior of the brain.

Cerebellar abscess is also often secondary to infective labyrinthitis, extension of the disease taking place along the nerve-sheaths, or directly in the region of the posterior semicircular canal.

Leptomeningitis is either (a) secondary to a gross intracranial lesion or bone disease, in which case it is due to the rupture of an abscess into the intradural space, or to vascular infection from the lateral sinus, abscess, or bone, as the case may be; or (b) to labyrinthitis, with infection spreading along the nerve-sheaths, or vascular infection from the middle ear direct.

Infection of the labyrinth is responsible for many cases of cerebellar abscess and meningitis of otitic origin.

A. NINIAN BRUCE.

**AURAL VERTIGO (NON-SUPPURATIVE): A CLINICAL AND**

(94) THERAPEUTICAL STUDY. R. LAKE, *Lancet*, Dec. 14, 1912, p. 1638.

THE author classifies aural vertigo as follows:—

1. Peripheral causes: (a) chronic progressive middle-ear deafness, (b) hæmorrhage into labyrinth and embolism, (c) traumatism.

2. Aural vertigo due to altered state of blood pressure: (a) increased blood pressure, and (b) diminished blood pressure.

3. Aural vertigo due to general systemic causes: (a) leukæmia, (b) occasional, (c) with ocular symptoms, (d) specific, (e) cerebral anæmia.

He then discusses these in detail.

A. NINIAN BRUCE.

**RHEUMATIC NEURITIS.** (Contribution à l'étude des névrites (95) rhumatismales.) R. PIERRET, *L'écho méd. du Nord*, 1912, xvi., p. 585.

A RECORD of three cases. 1. A man, aged 35, developed neuritis of the left arm six weeks after acute articular rheumatism. An attack three years before had also been followed in convalescence by the same sequelæ. The lesion was manifested by very marked motor and sensory disturbance. There was only slight diminution of electrical excitability. Complete recovery took place in two months under electrical treatment combined with salicylates. No other cause for the neuritis could be maintained, such as alcohol, syphilis, tubercle, or lead, and there were no stigmata of hysteria.

2. A man, aged 58, subject to rheumatic attacks since the age of 35, developed neuritis of the right upper limb, during an attack of generalised articular rheumatism. In addition to motor and sensory lesions, glossy skin was present. Complete recovery took place in a month and a half under aspirin and galvanic currents.

3. A man, aged 55, subject to rheumatism since the age of 14, developed neuritis of the lower limbs during an attack of rheumatism. Alcoholism in this case acted as a predisposing cause. Rapid atrophy of the calf muscles ensued. The patient was still under treatment. The prognosis was good, as there was no RD.

J. D. ROLLESTON.

**GANGLIONIC GLIONEUROMA OF THE OPTIC NERVE.** G. C. (96) RUHLAND, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 5, Feb. 1, 1913, p. 363.

THE tumour was a well encapsulated semi-fluctuating mass about 3 cm. by 1.5 cm. It showed ganglionic cells, nerve fibres, and neuroglia. There was no involvement of the eyeball. It was considered to be congenital and was found in a girl who first showed signs of eye trouble at the age of 6. At 8 she caught scarlet fever and exophthalmos and complete blindness of the affected eye followed.

A. NINIAN BRUCE.

**SARCOMA OF LEFT FRONTAL LOBE OF BRAIN WITHOUT  
(97) DEFINITE SYMPTOMS UNTIL SHORTLY BEFORE DEATH.**

B. M. RANDOLPH, *Journ. Amer. Med. Assoc.*, Vol. 1x., No. 1, Jan. 4, 1913, p. 30.

THE patient was a woman, aged 65, single, and of high intellectual and social attainments. About a year before death it was noticed that she would sometimes stop in the middle of a sentence, but otherwise was in her usual health and remained so for the next eleven months. She then lost interest in her friends, became hazy, unresponsive, and apathetic. Reflexes normal, no optic neuritis nor headache, and no paralysis. These symptoms became rapidly more marked until a few days later when she suddenly passed into a state of stupor, dying after a few days apparently from medullary paralysis.

At the autopsy an ovoid tumour about the size of a small hen's egg was found on the lower and inner aspect of the left frontal lobe. The margins were not clearly defined. The entire third frontal convolution showed acute softening. The tumour proved to be a round-celled sarcoma.

A. NINIAN BRUCE.

**TWO CASES OF COLLOID TUMOUR OF THE THIRD VENTRICLE,  
(98) CAUSING DEATH. ARTHUR J. HALL, *Lancet*, Jan. 11, 1913, p. 89.**

CASE I. Man, middle-aged, was found lying in the street unconscious, and died a few hours after admission to hospital. No history could be obtained. At the necropsy a globular, semi-translucent tumour was found lying in the anterior part of the third ventricle. It was about the size of a small toy marble, and was attached to the anterior part of the right choroid plexus by a narrow band of fibrous tissue. The anterior ends of the optic thalami were hollowed out by the convex surface of the tumour which had pushed down the front part of the velum interpositum.

Case II. Girl, aged 18, who had suffered from nocturnal enuresis since childhood, but from no other illness except recurrent headaches during the previous six months, was found lying dead in bed. At the necropsy a similar tumour to that described above was found, also attached to the anterior end of the choroid plexus, and resting on the velum interpositum.

The two tumours were smooth, soft, and gelatinous, but on hardening had a firm, semi-translucent, almost cartilaginous, consistence and a homogeneous structure. The bulk of the tumour consisted of a structureless hyaline matrix, containing at wide intervals epithelial cells in various stages of degeneration. It was surrounded by several layers of well-formed fibrous tissue.

A short account of seven other similar cases from the literature is given.

A. NINIAN BRUCE.

**VERTEBRAL CARIES: POTT'S DISEASE WITHOUT CURVATURE IN THE SENILIUM.** (Cárie des vertèbres: mal de Pott sans gibbosité à un âge avancé.) ROTSTADT, *Nouv. Icon. de la Salpêtrière*, Sept.-Oct. 1912, p. 391.

THE author describes a case of Pott's disease in a man of 72, who presented symptoms of cord compression at the level of the eighth cervical segment. The compression slowly became more and more complete. At first there was no pain, but later pains in the limbs developed. At no time was any bony malformation of the vertebral column to be found, but not long before the patient's death a cold abscess showed itself in the neck, posteriorly. At the necropsy the inferior cervical vertebræ were found to be completely disintegrated, the dura mater thickened, while caseous masses surrounded the membranes and distorted the cord. It is interesting to note that while the main seat of the disease was extradural, there was in the early stages, clinically, a dissociated anæsthesia.

S. A. K. WILSON.

**CHROMATOPTIC WORD DEAFNESS.** (Note sur la surdité verbale (100) chromatoptique.) DAVIDENKOF, *L'Encéphale*, Aug. 10, 1912, p. 127.

By "amnesic achromatopsia" (*amnestische Farbenblindheit*) is designated inability to name colours with perfect preservation of colour vision. Such a condition ought to be classed with the aphasias, and Monakow gave it the name of "achromatoptic aphasia." Lewandowsky supposed in such a case the representation of the colour of an object was dissociated from the general representation of the object, its form, &c. In most cases hitherto recorded there has been difficulty in recalling the correct name of the colour, a form of verbal amnesia. Davidenkof, however, reports several cases where the defect was constituted by loss of the comprehension of these words for colours. In them, further, colour vision was intact, as also the representation of the colours of objects. He proposes the term "chromatoptic word deafness" to express the condition. In these cases the sole indication of sensory aphasia was loss of the meaning of colour words. They are interesting and well worth reading in the original.

S. A. K. WILSON.

**BILATERAL MOTOR APRAXIA WITH AUTOPSY.** (Apraxie (101) motrice bilatérale: autopsie: contribution à la localisation de l'apraxie.) D'HOLLANDER, *L'Encéphale*, June 10, 1912, p. 506.

A FEMALE patient of 55, presenting a combination of paraphasia and bilateral motor apraxia, with certain symptoms of delusional insanity. She had no word deafness or blindness, no paralysis or



ataxia. There was, further, no agnosia as regards objects, and no defect of memory or attention. It seems clear that the defect was a pure motor apraxia, and not an ideational apraxia; at the same time the symptoms were not very severe. Automatic movements (walking, eating, swallowing, &c.) were unimpaired. There was very little perseveration to be noted.

In the left hemisphere was an area of softening involving the limbic gyrus, the lingual and fusiform gyri, the cuneus, part of the third temporal convolution, and the white matter underneath the third and second temporal gyri and the angular gyrus, as well as part of the inferior parietal lobule. In this way the left sensomotorium must have been isolated in great part from the large posterior associational area of Flechsig. In the right hemisphere the posterior half of the superior frontal gyrus was softened. The author supposes that each of the two lesions was the cause of the apraxia in the opposite limb, although there are certain objections to this opinion that might be offered.

S. A. K. WILSON.

**ON THE RESPIRATORY NEUROSES.** SAMUEL WEST, *Lancet*, Nov. (102) 16, 1912, p. 1352.

THE neuroses of the respiratory organs fall into two groups. The first group is associated with dyspnoea and cyanosis, and in it are found (1) asthma, (2) laryngismus stridulus and some other laryngeal spasms, and (3) whooping-cough. The second group is not associated with dyspnoea or cyanosis, and contains (4) paroxysmal tachycardia, (5) the air-hunger of diabetes mellitus and the allied condition in uræmia, and (6) periodic respiration in its two forms, viz., grouped respiration and Cheyne-Stokes breathing.

A general consideration of each of these seems to lead to the same conclusion, viz., that it is not the respiratory centre in the medulla that is at fault, but some higher co-ordinating centres possibly in close relation with the other centres of volitional action, and therefore presumably in the cortex of the brain.

A. NINIAN BRUCE.

**MYOTONIC DEFECTS IN PARALYSIS AGITANS.** (Des troubles (103) d'apparence myotonique dans la maladie de Parkinson.) G. MAILLARD, *L'Encéphale*, Ann. vii., No. 12, Dec. 10, 1912, p. 433.

APART from the ordinary stiffness and slowness of movement characteristic of Parkinson's disease, the author has remarked a curious inability to relax the innervation of a given muscle during as long as from 10 to 30 seconds. In the case here described the phenomenon was particularly well seen in the orbicularis oculi on

both sides. Again, in pronouncing certain letters, the patient was unable to arrest phonation during some seconds, so that the "a" of Paris, patrie, &c., became most unduly prolonged. Other more or less similar cases have been already published. The author believes the phenomena bear only a superficial resemblance to the true myotonia of Thomsen's disease. S. A. K. WILSON.

**PARALYSIS AGITANS IN NEGROES.** C. W. BURR, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 1, Jan. 4, 1913, p. 43.

A DESCRIPTION of a case in a negro, aged 52, who presented the typical appearance of the disease barring tremor. It is pointed out that paralysis agitans is a very rare disease in the negro. Idiopathic epilepsy is as common in negroes as in whites, but, while the gross nervous syphilitic diseases are common, the so-called parasyphilitic diseases are very rare. A. NINIAN BRUCE.

**ON THE PSYCHOPATHOLOGY OF PARALYSIS AGITANS.** (Zur (105) *Psychopathologie der Paralysis agitans.*) H. KÖNIG, *Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

THE material consisted of twenty-three cases observed in the Kiel clinic. In his original work Parkinson made no mention of mental disorders in paralysis agitans, but later authorities have furnished considerable case-material. Previous authors have agreed in the following statements:—

1. Parkinsonians show an abnormal mood, usually a depression.
2. In the course of the disorder transitory delirious conditions of confusion are apt to occur.
3. In some cases a definite psychosis develops, most commonly a melancholic or paranoic picture.
4. In the absence of senile and arterio-sclerotic dementia intelligence and memory remain intact.

König confirms these conclusions. C. MACFIE CAMPBELL.

**A CASE OF TETANUS TREATED BY MASSIVE DOSES OF (106) ANTITETANIC SERUM.** (Un cas de tétanos traité par les injections massives de sérum antitétanique.) J. DARIER and C. FLANDIN, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 458, J. RENAULT, *ibid.*, p. 463.

A FATAL case in a woman, aged 27, in whom treatment was started less than twenty-four hours after the onset. 242 c.c. of antitetanic serum were given, 220 intravenously, and 22 intraspinally. Death took place in three days with symptoms of bulbar intoxication,

No cerebral or meningeal lesions were found post mortem. In the subsequent discussion Renault related the case of a boy, aged 11 years, who recovered from severe tetanus after receiving subcutaneous injections of 260 c.c. in the course of five days.

J. D. ROLLESTON.

**THE AVENUES OF RHEUMATIC INFECTION; BASED UPON**  
(107) **EXAMINATION OF SEVENTY-FIVE CASES OF SYDEN-**  
**HAM'S CHOREA.** W. P. S. BRANSON, *Brit. Med. Journ.*, Nov.  
23, 1912, p. 1429.

SYDENHAM'S chorea and rheumatic fever are due to one and the same infecting agent. The action of the rheumatic poison upon a specially predisposed nervous system produces a characteristic nervous instability which may precede the appearance of choreic movements by some weeks, and may in other cases itself constitute the sole evidence of the choreic tendency, the phase of movements never becoming developed at all. The emergence of choreic movements is determined by emotional stimuli acting upon a central nervous system, thus previously disequibrated.

The commonest avenue of rheumatic infection is the tonsil, and next to it the nose. The first essential of rational treatment of rheumatic infection is restoration of the upper air passages to a healthy condition. It is recommended that the tonsils be removed in all rheumatic children who exhibit chronic tonsillar enlargement.

A. NINIAN BRUCE.

**A CASE OF ADDISON'S DISEASE TREATED WITH TUBER-**  
(108) **CULIN.** J. M. H. MUNRO, *Brit. Med. Journ.*, March 23, 1912, p. 665.

THE patient was a lady, aged 34, who showed the usual symptoms of Addison's disease, including pigmentation. There was no evidence of tubercle, but one sister, whom she had nursed, died from phthisis. The blood pressure varied from 110 to 120 mm. She was given  $\frac{1}{1500}$  mg. tuberculin, increased gradually up to  $\frac{1}{800}$  mg., and ultimately was able to resume her old life and home duties. The pigmentation became much less. Suprarenal extract did not seem to agree with her. Apart from one relapse five months later, for which she received thirty-four inoculations of  $\frac{1}{1000}$  mg. T.R., the improvement was maintained, and she was in good health three years later.

A. NINIAN BRUCE.

**NERVOUS AND MENTAL SYMPTOMS IN A CASE OF ADDI-**  
(109) **SON'S DISEASE.** J. G. PORTER PHILLIPS, *Brit. Med. Journ.*,  
Dec. 21, 1912, p. 1705.

THE case of a man, aged 49, who became depressed and restless. Tremors of the hands, lips, and tongue developed, and neurasthenia

was diagnosed. He then became suspicious, more depressed and lost weight. He had hallucinations of taste and smell and delusions about his personal appearance. The knee jerks were exaggerated, muscular tone was diminished, the pupils were unequal and reacted sluggishly to light. His speech became slow and sluggish, and his handwriting irregular. Incipient general paralysis was diagnosed, and he was removed to Bethlem Royal Hospital. He became more suspicious and had to be fed by tube. He continued to lose weight and became cachectic (non-pigmented). Abdominal pain, diarrhoea, cachexia, and asthenia became very marked with vertigo and syncope.

At the autopsy no evidence of general paralysis or any cerebral condition could be discovered, but the suprarenal glands were enlarged, sclerosed, and hæmorrhagic. No tubercle bacilli could be found.

A. NINIAN BRUCE.

**THYRO-TESTICULO-HYPOPHYSEAL SYNDROME.** DE CASTRO, (110) *L'Encéphale*, Nov. 10, 1912, p. 329.

A MALE patient of 44 noticed, some five or six years ago, that his features were changing gradually, becoming coarser and heavier. When he came under the author's observation, he was found to have a typical acromegalic facies, with macroglossia and exophthalmos. The thyroid was enlarged and goitrous. The penis and testicles were small and atrophic. Glycosuria was present. X-ray examination revealed enlargement of the sella turcica.

It is unsatisfactory not to find any reference to a number of important clinical points in a case of this interest.

S. A. K. WILSON.

**HYPOPHYSO-GENITAL SYNDROME OF SYPHILITIC ORIGIN.** (111) (*Syndrome hypophyso-génital d'origine syphilitique.*) P. CARNOT and J. DUMONT, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 430.

THE patient was a man, aged 36, who had contracted syphilis at 18. Six years later polyuria and polydipsia developed, and in another five years progressive diminution of vision and severe headaches occurred which yielded to syphilitic treatment. Finally testicular atrophy and impotence supervened, though without obesity. The pituitary lesions were of an atrophic nature, as the X-rays showed that the sella turcica was not enlarged, but the enlargement of the frontal, maxillary, and sphenoid sinuses and thickening of the cranial bones indicated that the hypophysis or juxta-hypophyseal region was involved,

J. D. ROLLESTON.

## PSYCHIATRY.

**POLYNEURITIC PSYCHOSIS AFTER INDUCED ABORTION.**

(112) (*Polyneuritische Psychose nach künstlichem Abort.*) R. HAHN,  
*Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

THE report of a case of Korsakoff's psychosis after induced abortion in a woman of 31, in whom alcoholism could be excluded.

C. MACFIE CAMPBELL.

**THE SIMULATION OF INSANITY AND GANSER'S SYNDROME.**

(113) (*Simulation de la folie et syndrome de Ganser.*) RÉGIS,  
*L'Encéphale*, Aug. 10, 1912, p. 97.

PROFESSOR RÉGIS points out clearly how the symptom of "absurd answers," of "answering at random," can no longer be held to be of the diagnostic value for simulation that it was formerly thought to possess, and illustrates its occurrence in certain psychoses that may lead subsequently to dementia.

S. A. K. WILSON.

**ON SUICIDE.** (*Ueber Selbstmord.*) WASSERMEYER, *Arch. f. Psychiat.*,  
(114) Bd. 50, H. 1, 1912.

AN analysis of 169 cases of attempted suicide, 90 men, 79 women. Of the men 27 were insane, of the women 57. Extremely condensed summaries of the cases are given. Two of the women were diagnosed as hysterical psychoses. Of the men who were not insane, half were chronic alcoholics. Among the women who were not insane, the majority were hysterical. Statistics with regard to successful suicide would naturally differ considerably from those with regard to unsuccessful attempts.

C. MACFIE CAMPBELL.

**ON THE PATHOLOGICAL ANATOMY OF KORSAKOFF'S DIS-**

(115) **EASE.** (*Zur pathologischen Anatomie des Korsakowschen Symptomen-Komplexes alkoholischen Ursprungs.*) E. MEYER,  
*Arch. f. Psychiat.*, Bd. 49, H. 2, 1912.

THE report of one case with a review of the literature. The author concludes that some of the cortical changes are to be referred to the initial delirium tremens; others can be correlated with the chronic alcoholism; while a third series are to be more definitely referred to the Korsakoff disorder. It is doubtful whether, with our present histopathological data, the two latter groups of pathological changes can be separated as strictly as is done by Meyer in this contribution.

C. MACFIE CAMPBELL.

## TREATMENT.

**THE TREATMENT OF MUSCULAR PARESIS BY MEANS OF  
(116) ECCENTRIC MOVEMENTS.** R. ABERCROMBIE, *Brit. Med. Journ.*, Feb. 8, 1913, p. 277.

By a "concentric movement" is meant the ordinary movement of a muscle which does work while *becoming shorter*, and a muscle is said to perform an "eccentric movement" when it does work by *becoming longer*. The general rule for the performance of eccentric movements is that the manipulator first puts the muscle into its shortest position, and then gradually elongates it, while the patient resists the elongation. Such movements are of more value in the treatment of paresis than the more ordinary employed muscular movements.

A muscle which appears functionless when overstretched can yet exhibit contractile power when put into its shortest position, for in the latter position the sheath of the muscle is relaxed, the channels of the dark band do not press on one another, and therefore their pores will be unobstructed, and the ingress of the translucent material easy.

A. NINIAN BRUCE.

**HIGH FREQUENCY CURRENTS IN TRIGEMINAL NEURALGIA.**  
(117) W. F. SOMERVILLE, *Brit. Med. Journ.*, Dec. 21, 1913, p. 1706.

THE author emphasises very strongly the great value of high frequency electricity in trigeminal neuralgia, even in cases of long standing, and records a case in a lady, aged 60, who suffered from severe pain in the right side of the face of eight years' duration. The attacks were frequent and severe, her general health had suffered, and she lived in constant dread of their return. Ionisation had proved of no benefit. High frequency electricity was begun on 2nd Nov., and continued daily to Christmas with great benefit. The pain returned during the break of the Christmas holidays. Treatment was renewed and continued until June, when the neuralgia had entirely disappeared and she had a general feeling of well-being. There was no recurrence five months later.

A. NINIAN BRUCE.

## Meeting of Congress.

### THIRD INTERNATIONAL CONGRESS OF NEUROLOGY AND PSYCHIATRY.

THE next meeting of this Congress will be held at Gand (Belgium) on 30th August 1913, the two previous meetings having been held at Brussels (1897) and Amsterdam (1906).

The Congress at Gand is organised under the patronage of *MM. les Ministres de la Justice et de l'Intérieur* by the *Sociétés de Neurologie et de Médecine Mentale de Belgique*. Numerous supporters have already promised their assistance: van Deventer (Amsterdam), Marinesco (Bucharest), Parhon (Bucharest), Serieux (Paris), Ferrari (Boulogne), Wagner (Vienna), Dustin, Menzerath, Geerts, Laruelle, Deroitte (Brussels), Claus (Anvers), Meeus (Gheel), Willems (Louvain), &c.

The international exhibition at Gand will form an important attraction for members.

All inquiries should be addressed to Dr Crocq, 62 Rue Joseph II., Brussels.

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### BOOKS AND PAMPHLETS RECEIVED.

Babinski, J. "Réflexes Tendineux et Réflexes Osseux" (*Bullet. Med.*, Oct. 19 and 26, Nov. 6 and 23, 1912).

Babinski, J., Chaillous, J., and Martel, Th. de. "Stase papillaire bilatérale cécité presque complète craniectomie décompressive sans incision de la dure-mère. Guérison" (*Soc. de Neurol. de Paris*, April 25, 1912).

Babinski, J., and Jumentié, J. "Contribution à l'étude de l'hémorragie méningée" (*Bull. et Mém. de la Soc. méd. des Hôp. de Paris*, Mai 31, 1912).

Babinski, J., Martel, Th. de, and Jumentié, J. "Tumeur méningée de la région dorsale supérieure; paraplégie crurale par compression de la moelle. Extraction de la tumeur; Guérison" (*Soc. de Neurol. de Paris*, Avril 25, 1912).

Briggs, L. Vernon. "Three months without and three months with a social service worker in the mental clinic at the Boston Dispensary" (*Amer. Journ. Insanity*, Vol. lxi., No. 2, Oct. 1912).

Cooper, J. W. Astley. "Pathological Inebriety; its causes and treatment." Baillière, Tindall & Cox, London, 1913. Pr. 3s. 6d. net.

Flexner, Simon, and Noguchi, Hideyo. "Experiments on the Cultivation of the Virus of Poliomyelitis," Fifteenth note (*Journ. Amer. Med. Assoc.*, Vol. lx., No. 5, Feb. 1, 1913).

Ingenieros, José. "Principios de Psicología Biologica," Daniel Jorro, Madrid, 1913. Pr. 6 pesetas.

Kingsley, J. S. "Comparative Anatomy of Vertebrates," John Murray, London, 1912. Pr. 12s. net.

*The Training School*, Vol. ix., No. 9, Jan. 1913. Vineland, New Jersey, U.S.A.

# Review of Neurology and Psychiatry

## Original Articles

### MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM: THEIR STRUCTURE AND HISTOGENESIS.\* †

By the late ALEXANDER BRUCE, M.D., LL.D., F.R.C.P.E. ; and  
JAMES W. DAWSON, M.D. (Carnegie Research Fellow).

*(From the Royal College of Physicians' Laboratory, Edinburgh.)*

(With 16 Plates.)

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\* [Note by Dr James Ritchie, Superintendent, Royal College of Physicians' Laboratory.—During Dr Alexander Bruce's lifetime a full investigation had been made of the spinal cord of the case which is the subject of this paper. The characters of the neuromata and their connections with the aberrant nerve fibres present



## CONTENTS—continued.

## III. The Genesis of Peripheral Nerves.

## (1) Embryogenesis.

Note on the genesis of fibres in the central nervous system.

## (2) Histogenesis in regeneration.

Note on the regeneration of fibres in the central nervous system.

## (3) Histogenesis in tumour formation.

(a) Ganglio-neuroma.

(b) Neuroma.

(c) Neuro-fibroma.

Note on the genesis of fibres in tumours of the central nervous system.

(a) Glioma and neuro-glioma

(b) Neuroma.

RECENT investigations have profoundly modified our conception of the value of the histological elements of the nervous system. Conflicting opinions are still held on many points of primary importance, perhaps the chief of which is the relation of the nerve fibre to the nerve cell. The origin of the nerve fibre is a problem of vital interest not only to the embryologist, but also to the physiologist and the pathologist. It has long been the subject of controversy, and, in spite of numerous valuable researches, we are still far from knowing the relation of the nerve fibre to the central neuroblast, a relation of essential importance in the understanding of all neuro-pathological questions.

Researches on the embryogenesis and mode of regeneration of the peripheral nerves have led, amongst other things, to a new interpretation of the nature and mode of development of the new growths which arise in relation to nerves. They have given a new significance and a new conception to the term "neuroma," as they have also reaffirmed the existence of the "true" neuroma as a definite group of tumours.

The term neuroma conveys to many minds no definite conception. Odier, in 1803, suggested the name to designate "deep-seated tumours which are characterised by painful swelling of the

had been considered and were the subject of a preliminary communication before the Pathological Society of Great Britain and Ireland in 1910 (see *Journ. Path. and Bacteriol.*, Cambridge, Vol. xv. (1911), p. 127). It was not until after Dr Bruce's death, however, that the medulla was examined and the younger nodules present discovered. Dr Dawson is thus responsible for that part of the paper which deals with the bearing of these latter observations on the origin of the tumours and on the significance of the underlying processes in relation to the question of the embryology of nerve fibrils generally.]

† This paper was communicated to the Royal Society of Edinburgh, and has been published in their *Transactions*, Vol. xlviii., Part III. (No. 27), 1913.

nerves involved." The term came into use to indicate any tumour in relation to a nerve, thus indicating its most important clinical feature, whatever its histological structure might be. Early writers ascribed their origin to an overgrowth of the connective-tissue sheaths of the nerve, and apparently took it for granted that a tumour composed of nerve tissue could not exist. Virchow, in 1863, placed the pathology of neuroma on a histological instead of a clinical basis, when he distinguished between true neuroma (*neuroma verum*) and false neuroma (*pseudo-neuroma*). True neuromata arise in the nerve tissue, and nerve tissue enters into them as an essential constituent. False neuromata arise in the interstitial connective tissue of the nerves. True neuromata were further divided into "*neuroma ganglio-cellulare*," containing newly formed nerve cells; *neuroma fibrillare amyelinicum*, containing chiefly non-medullated nerves; and *neuroma fibrillare myelinicum*, consisting chiefly of medullated fibres. Virchow stated that the nervous nature of many neuromata had been overlooked because the non-myelinated fibres had been mistaken for connective-tissue fibres, and because many of the fibres, both medullated and non-medullated, had disappeared through pressure and had been converted into connective-tissue-like elements. This classification was regarded as unsatisfactory, especially by those who considered nerve fibres as the processes of ganglion cells, and who thought, therefore, that there could be no fasciculated neuroma without ganglion cells, because nerve fibres are elements incapable of proliferating independently of the cell with which they have a direct connection.\*

The present paper is founded on material derived from a patient who had suffered from spastic paraplegia, and in whose spinal cord, medulla oblongata, and pons, multiple fasciculated neuromata were found. In these nodules no ganglion cells could be traced, and nerve fibres, of the structure of peripheral nerves, were present in different stages of development. Inasmuch as the elements of a tumour differ from the tissues in which they take their origin, and the diversity frequently consists in a return to the embryonal phases of the elements themselves, it seemed necessary, in considering the case, to study the literature bearing upon the development of peripheral nerves in order to arrive at a true solution as to the genetic relation of the elements.

\* For a further consideration of this subject, see under III. (3).

Further, as in regeneration of nerves these embryonal phases of development are often reproduced, the literature on the regeneration of nerves after section was next investigated. And, finally, as pathological histology has often shed light on normal tissue development, the literature bearing on tumours related to nerves has passed under review. Aided thus by collateral evidence adduced from the three sources of embryogenesis, regeneration, and tumour formation, an endeavour has been made in the following paper to give an interpretation of the histological picture which a study of numerous nodules revealed. The consideration of our work will thus be carried out under the following headings:—

I. Histological Study of Multiple Neuromata of the Central Nervous System.

II. Interpretation of Observations and Conclusions.

III. The Genesis of Peripheral Nerves:

- (1) Embryogenesis: with a note on the genesis of fibres in the central nervous system.
- (2) Histogenesis in Regeneration after Section: with a note on regeneration of fibres in the central nervous system.
- (3) Histogenesis in Tumour Formation:—(a) ganglioma; (b) neuroma; (c) neuro-fibroma: with a note on genesis of fibres in tumours of the central nervous system:—(a) glioma and neuro-glioma; (b) neuroma.

## I. HISTOLOGICAL STUDY OF MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM.

### INTRODUCTION.

#### *Clinical History.*

We are indebted to Dr R. A. Lundie for the following clinical notes on the case:—

The patient, H. S., died at the age of 30 on 11th November 1909. Her father, on that date, was alive and well, aged 46; her mother had died at 36 during childbirth; and she has four brothers and two sisters all alive and well.

At the age of 7 she had "water in the head." Three years later she began to lose power gradually in both legs, the left leg being first affected. This gradually progressed, until at the age of 22 she became bedridden. Urinary troubles began with incontinence and continued throughout life; the bowels were very constipated, and she required aperient medicine regularly. She complained often of headache; her sight was very dim, and she could not see to read. No view of the fundus could be obtained on account of a diffuse opacity of the vitreous. She had often complained of pain in the left side, and had frequent attacks of gastritis and stomatitis.

Post-mortem report (by Dr Harvey Pirie, about twenty-four hours later):—

Body much emaciated; arms flexed at the elbow and wrist, but flexion could be overcome. Left leg fully flexed at the knee, flexed and markedly abducted at the hip (contracture). The right leg slightly abducted at the hip; fixed in fully extended position. Lumbar spine in position of marked lordosis.

*Spinal Cord.*—Dura somewhat thickened, especially in the cervical region, the cord as a whole being very atrophied. On the surface no obviously sclerotic patches to be seen, but on section bluish gelatinous patches were seen to involve a large part of the sectional area of the cord throughout its whole length.

*Brain.*—The medulla, and even more so the pons, show great general atrophy. On section this appeared to be diffuse, there being no appearance of any special sclerosed patches. The cerebellum also appears atrophied; there is no apparent atrophy of the cerebrum, which appears pale on section.

*Abdomen.*—Intestines chiefly in pelvis, as the lordosis has almost abolished the upper part of the abdomen in its antero-posterior diameter. The large intestine is so shrunk that it is smaller in diameter than the small intestine. The stomach is small and contained coffee-ground-looking material; no ulceration.

*Eye.*—Posterior half of left globe removed.

*Methods.*—Portions of the cord, medulla oblongata, and pons were fixed in Zenker's solution and in 10 per cent. formalin solution for the examination of cell and protoplasmic structures, in 96 per cent. alcohol for Cajal's reduced silver method for axis-

cylinders, and in 10 per cent. formalin solution with after-hardening in Müller's fluid for medullated sheaths. The paraffin sections were cut at  $7\mu$ , and were stained with hæmatoxylin and eosin, Van Gieson's stain, Heidenhain's iron-hæmatoxylin, and Unna's polychrome methylene-blue. Weigert's elastic tissue and Mallory's connective-tissue stains were also used. The celloidin sections were stained with the Kulschitzky-Pal modification of Weigert's medullated sheath stain, with Van Gieson's stain, and with the Bielschowsky-Williamson axis-cylinder method.

The following regions were examined in serial paraffin or celloidin sections: the whole of the pons, medulla oblongata, the 7th and 8th cervical and 1st dorsal segments, and the whole lumbo-sacral cord. Portions from each of the remaining segments of the cord were prepared both for paraffin and celloidin: two segments in the upper and two in the lower dorsal regions being cut in serial longitudinal, frontal section.

The preliminary investigation was confined entirely to the cord. Subsequently the medulla and pons were examined, and as the formations in these regions seemed at first sight essentially different from those in the cord, it is natural that the subject should be considered under the two headings: the one, the spinal cord; the other, medulla oblongata and pons.

### 1. SPINAL CORD.

Enormous numbers of nodules of neuroma were found distributed in the cord substance throughout its whole length, except in the upper five cervical and in the 2nd and 3rd dorsal segments. In those segments cut serially (7th cervical to 1st dorsal inclusive, and the lumbo-sacral), nodules could be traced in every preparation, often indeed numerous nodules in each section. All the remaining segments showed definite nodule formation or indications that such had existed.

Throughout the whole of the spinal pia abnormal, medullated fibres were found. In the upper cervical region these were very scattered and cut mostly transversely, so that they appeared as fine dots bordering especially the outer layer of the pia. In the cervical enlargement and dorsal cord they became more numerous and strands of fine fibres could be traced, cut longitudinally or transversely, both in Van Gieson- and Weigert-stained prepara-

tions. In the lumbo-sacral cord the pia was infiltrated with fibres forming strands, tufts, and nodules. These were very markedly accumulated in the region of the anterior fissure and of the ligamentum denticulatum, and in the latter situation they formed frequently a nodule as large as the cross-section of the ligament itself. The pial fibres in the lumbo-sacral cord were so numerous that the whole circumference of the pia was seamed with strands of four to twelve fibres cut longitudinally, or obliquely, or transversely, and in the adventitia of the pial vessels they formed an encircling reticulum. It was specially noted that throughout the whole of the pia covering the posterior columns and in the posterior median septum there was scarcely any evidence of any abnormal fibres: the only sections noted as showing such were in the 5th cervical segment and in the lower dorsal cord. These were very few in number and passed through only a few sections.

Most of the previous observations on such fasciculated neuromata have been confined to abnormal fibres or small nodules in the pia and very isolated nodules in the cord substance. Orzechowski has recorded the existence of very numerous nodules in the pia and in the region of the central canal in the lumbo-sacral cord in a case of tabes with a malformation of the lateral recess of the 4th ventricle. In his description he remarks that it is sufficient to give the details of one segment, as all showed similar characters. In our sections the great variation in the histological picture is amongst its most prominent features, for each serial section showed successive changes, and in preparations, even six or eight celloidin sections apart, the change was so distinct that without the intervening sections it would have been impossible to relate them to one another. It will be concluded from this that the nodules were microscopic: even so large a nodule as that represented in Fig. 29 passed, as a nodule, through at most twelve to fifteen paraffin sections. Its formation and breaking up could be traced in two or three sections on either side.

Other points in which the neuromata in this case differ are that, with few exceptions, in those previously described the neuromata, when they existed in the cord substance itself, seem to have been defined, almost encapsuled, by dense glia tissue. Again, many writers have spoken of having been quite unable, even in serial sections, to trace any connection of the fibres of the nodules with fibres of the surrounding parts. Others have

definitely traced the nodules to fibres arising in relation to anterior nerve roots (Orzechowski), or posterior nerve roots (Raymond). The nodules present in this case showed no encapsulation with glia tissue, and, almost without exception, the origin of the fibres composing them could be followed for some distance.

The neuromata were present free in the pial spaces, in the walls of vessels of the pia, pial septa, and cord substance, forming either a nodule at one side of the vessel or surrounding the vessel as a more or less thick sheath; and finally, they were present lying quite free in the white and grey matter in definite contiguity with the nervous elements.

The term "neuroma" is here given to all abnormal fibres as well as nodules, for it is evident that the difference between them lies wholly in conditions of space and possibly of time. It is assumed that the fibres that have plenty of lymph space show few intertwinings, while the fibres which have met with any obstruction in their course, *e.g.*, from a blockage of the lymph-path, necessarily become twisted and coiled into nodules, the most typical form of which gives the impression of a rolled-up ball of wool cut through the centre (Figs. 8 and 29).

It would be quite impossible to give anything like a complete picture of the findings in the different regions. To attempt to do so would be to lose ourselves in a maze of detail, but an effort will be made to convey a clear conception of the chief forms with their structure and mode of formation, the disposition and origin of the fibres composing them, and their relation to one another and to the tissues around.

Before passing to this study it is necessary to refer to other pathological processes present in the cord. The clinical features were those of disseminated sclerosis, and at the post-mortem examination the naked-eye appearances of the cord seemed to confirm this diagnosis, for we have noted that on cross-section the characteristic bluish, gelatinous patches involved a large part of the sectional area of the cord throughout its whole length. Weigert preparations at different levels showed, under low power, areas of sclerosis, but under a higher magnification Weigert-fuchsin preparations indicated that these were not typical patches of disseminated sclerosis, but were rather areas of marked fibrosis.

Within these fibrosed areas were found evidences of neuroma

formation, and it was assumed that the fibrosis was an accompaniment or a sequel to the nodule formation. Sections of the cord at certain levels showed a more or less normal structure, with the exception of the presence of small neuromata, either in the vessel-walls or in the cord substance. Such nodules seemed to be the earliest stage of a process which ended in a complete disappearance of the nodule and a replacement, not only of the nodule, but of the previously healthy surrounding nerve tissue by a fibrosis, whilst in the surrounding zone there was a sclerosis comparable to that found in disseminated sclerosis. Between this earliest stage of a nodule in the midst of otherwise healthy tissue and the stage of complete fibrosis of the area there existed all degrees of transition, from a slight thickening of the wall of the vessel, almost invariably present in some relation to every nodule, to a further stage which showed an increasing involvement of the intertwining nerve fibres of the nodule, so that more and more connective tissue appeared amongst them, to a still further stage in which the nerve fibres were compressed and separated by the increasing fibrosis, and a yet later stage, when the fibrosis was so intense as to have left scarcely any trace of nodule formation and only ghost-tubes of former nerve fibres could be recognised. Such interlacing ghost-tubes gave the impression of a fine meshwork which, under high power, at first appeared as very fine capillaries but could be definitely analysed as nerve fibres with scarcely a trace left of axis-cylinder and myelin sheath and peripherally-placed nuclei.

When such a stage was reached there were added two other elements to the picture, the one a very marked infiltration of lymphocyte-like cells accompanying the increased condensation of the fibrous tissue, the other, a very intense glia cell proliferation and hyperplasia in the immediately surrounding nerve tissue. Still later in a few sections a stage was reached in which the fibrosis was not only the most dominant feature, but the only one, for Van Gieson and Weigert-fuchsin preparations showed an extensive area of dense fibrous tissue with few structural elements recognisable except small round cells around the vessels. Even these were frequently absent, and the vessels themselves were completely involved in the fibrosis.

There were in addition areas of true sclerosis independent of those associated with the fibrosis: the most constant of these



were the posterior column sclerosis and the area in the direct cerebellar tract.

To complete the histological picture it is necessary to refer to one very constant feature present throughout nearly the whole cord. The intra-medullary course of the posterior roots showed a very marked fibrosis. In Weigert preparations, the posterior root-entry zones were definitely degenerated, and in Weigert-fuchsin and Van Gieson preparations it seemed as if the neurilemma sheath in relation to the posterior roots were continued along the fibres right into the root-entry zone for a varying distance (Fig. 53). The anterior nerve roots in their intra-medullary course also showed this change, but to a less extent and less constantly, except in the lumbo-sacral cord (Fig. 54).

It will thus be seen that there were several distinct appearances present in the cord :—

(1) The neuroma nodules, and by neuroma again we refer to all stages in the development of a nodule from a few abnormal fibres in relation to vessels or the pial spaces to definite nodule formations.

(2) A fibrosis, in varying degrees of extension, involving areas in which neuromata had developed.

(3) A fibrosis of the intra-medullary portions of the anterior and posterior roots.

(4) The sclerosis which seemed independent of the presence of the fibrosis.

#### (1) NODULE FORMATION.

The detailed description of the nodules will be taken up in the following order :—

- (a) Disposition of the fibres forming the nodules ;
- (b) Structure and mode of formation ;
- (c) Origin of the fibres ;
- (d) Distribution of the nodules.

A convenient introduction to this study will be given by a brief reference to the first microscopic preparations examined. These were Van Gieson-stained paraffin sections from the 1st dorsal segment. It will be remembered that the 2nd and 3rd dorsal segments were almost typical in appearance, and in this segment the normal architecture of the cord was retained with the exception of the presence of two symmetrical areas on either side in the white matter immediately

adjoining the concave anterior and antero-lateral margins of the grey matter.

On the right side was the isolated oval nodule represented in Fig. 19, and on the left side a larger nodule, not so defined however. Under high power the nodule on the right side was found to be composed of nerve fibres cut transversely, obliquely, and longitudinally (*cf.* Fig. 6). The fibres had the structure of a peripheral nerve with axis-cylinder, myelin sheath, and neurilemma sheath, and had only a small amount of connective tissue between them. The nodule was defined from the surrounding healthy white matter by a deeply staining layer of connective tissue, and through its centre ran a thin-walled blood vessel.

On the left side the nodule was not defined from the surrounding tissue, and from its outer and anterior aspects radiated fine pink lines which, in their radiation, give off fine fibrils which enclose the adjoining normal fibres of the white matter with a pink zone—giving the impression that a very fine fibrillar connective tissue had in some way secondarily involved the fibres. Under high power the nodule had the same structure as that on the right side, and the pink lines were found to enclose very finely-calibred nerve fibres in which the yellow-staining myelin and central axis-cylinder could be recognised—the deeply-staining pink contours being gained by the increase of the connective tissue around these scattering fibres of the nodule. The vessel, found in relation to this nodule, was situated eccentrically, but in adjoining sections it assumed a more central position.

The very defined nature of the nodule (Fig. 19) enclosed by a dense layer of connective tissue, staining intensely pink with the fuchsin, gave the impression, under low power, that we were dealing with a nodule that had arisen in relation to the vessel-wall itself, possibly of the nature of a leio-myoma or of an endarteritic process. Higher magnification, however, revealed the nervous nature of the fibres, and subsequent sections stained with Cajal's and Weigert's methods showed the presence of numerous similar nodules and confirmed their nervous nature.

The first silver preparations examined were a serial set in which the nodule represented in Figs. 8 and 29 was found. A description of the very varied nature of the nodules will be attempted later, but meanwhile we may note the beautiful whorl-arrangement of the fibres composing this one.

The first Weigert preparations (Figs. 26 and 27) also gave beautiful nodules with a marked intertwining of the fibres. High-power examination showed that the internodal segments were short and irregular, and that the myelin sheath, though staining specifically, was thinner and not so intensively stained as the surrounding fibres of the white matter.

#### (a) *Disposition of the Fibres forming the Nodules.*

To recognise this it will be necessary to compare Van Gieson, silver, and Weigert preparations. The smallest and simplest neuroma forma-

tions are mere strands of fibres running parallel to each other; not strictly straight, but usually sinuous. Such simple strands, composed of from six to twelve fibres, were most frequently met with in the pia lateral to the emerging anterior roots (Fig. 39). An increasing complexity in the structure was initiated by an interlacing of the fibres as if these sinuous parallel fibres began to wind in and out amongst each other: such fibres were met with most frequently in the walls of blood vessels cut longitudinally (Figs. 32 and 33). A further stage in their evolution was reached by the convoluted course of the fibres, which seemed to coil spirally round other parallel longitudinal fibres or round a bundle of fibres cut transversely (Fig. 38).

From these simple formations we get all transitions to the tuft-like nodules, in which the interlacing is so dense as to appear an almost inextricable tangle (Fig. 30), or to the whorl-arrangement, in which the fibres appear to have some definite plan—the most typical being the ball-of-wool appearance already noted (Fig. 29). Sometimes the appearance was that of a ball of wool in which several successive threads had passed in the same direction and then suddenly the winding had commenced in another direction, so as to cross the former in varying degrees of obliquity; successive threads were then parallel for a time, till that direction again gave place to another. The increase in size of the nodule was accounted for by an agglomeration of bundles of fibres which simply repeated the primary groupings. At other times it seemed that each individual thread had wound in an independent direction, as if the ball had slowly revolved during the process of winding. On cross-section of such a ball, the fibres would then present an appearance much more uniformly transverse, while in the former case the fibres would be cut transversely, obliquely, and even for short lengths, longitudinally (Fig. 8).

It is impossible to give anything like an accurate description of the almost infinite variety in the disposition of the fibres. The fibres in their windings could sometimes be followed for a considerable distance, and at other times they seemed to bend at very sharp angles, often at right angles. The ball-of-wool appearance, in some form or other, was characteristic of the larger nodules—whether they were looked at, as it were, from the surface or on section.

#### (b) *Structure and Mode of Formation of the Nodules.*

*Structure.—Van Gieson Sections.*—We have already indicated that by simple nuclear staining and superficial examination the nodules might have been mistaken for leio-myomatous new formations. Under a higher magnification, the fibres composing the nodules were found to have the structure of the peripheral nerves, differing from these only in the closer disposition of the neurilemma nuclei and the finer structure, in general, of the fibre. Longitudinally cut fibres were stained yellowish-green, with a central thread—corresponding to the axis-cylinder—taking sometimes the pink stain of the fuchsin or the dark stain of the hæmatoxylin, and with a very fine pink line which at

frequent intervals showed an elongated nucleus in relation to it (Fig. 6). Transversely cut fibres appear as discs with a central point—the axis-cylinder—and an outer zone staining homogeneously yellowish-green, and each with a pink ring which gives the disc a very sharp contour (Fig. 6), and with an occasional nucleus applied to it. In nodules with fibres more closely arranged than in Fig. 6, the cross-section of the fibres was angular and flattened from pressure. Between the fibres was a varying amount, usually a very slight amount of connective tissue.

The most striking feature of the nodules was the very characteristic and numerous nuclei. In some nodules they were more numerous than in others (*cf.* Figs. 19 and 20). In all they were elongated on longitudinal section, with blurred ends, and with their long axis parallel to the long axis of the fibre. Further, the nucleus stained intensively, and a very distinct network and membrane and closely distributed, fine, chromatin granules could be made out, but, except in a few, no nucleolus. The cylindrical shape of the nucleus distinguished it from the oval nuclei of the endoneurium and of the endothelial cells, and they were further recognised by their arrangement and relation to the fibres. Sometimes, especially in the fibres breaking off from the nodules, long bands of fibres could be resolved simply into long stretches of nuclei, some of which showed a constriction in the middle. The nuclei belonging to the connective tissue stained less deeply, their longitudinal axis was not always parallel to the fibre, but often transverse, and further, they frequently showed nucleoli. The endothelial nuclei, which again might cause confusion, are larger, oval, less deeply stained, usually with nucleolus, and closely related to a lumen in which red blood cells could be recognised. It was impossible by means of any of the stains to distinguish the nerve fibre nuclei from the nuclei of the unstriped muscle fibres in the vessel-walls.

*Cajal's Silver Stain.*—The fibres stain intensely black and the longitudinal fibres show numerous irregularities and fine varicosities on their course. From the thicker fibres branch off delicate twigs, often at a sharp angle, and these fine twigs, twining round larger fibres, frequently end in a homogeneous bulb—similar to Cajal's *cone de croissance*. In the vessel-walls, especially of the smaller vessels, the fibres form a plexus of fine fibres with branchings ending in homogeneous cones or rings (Figs. 10-12). Along the course of the fibres are numerous elongated nuclei, and in relation to the transversely cut fibres are similar nuclei showing a circular outline. Both on longitudinal and transverse sections, the nuclei show a very intimate relation to the axis-cylinder (Fig. 8).

*Weigert's Medullated Sheath Stain.*—The larger nodules under low power stain almost as deeply as the surrounding fibres of the white matter; under high power this is shown to be due to their very close disposition, for the individual fibres are much more faintly stained than normal fibres. It is thus seen that the fibres are made up of

elongated, often bulging, cylinders, with a very narrow connecting bridge: the cylinders are longer in the darker stained fibres and shorter in the faintly stained, and the latter are best seen in the walls of vessels forming a reticulum (Figs. 13 and 25). When the strands of fibres are cut transversely there are numerous fine points amongst the larger cross-sections: these points correspond in all probability to the connecting bridges between the cylinders. The fibres composing the strands are in all cases much finer than the fibres of a peripheral nerve, or even of the nerve roots.

The further structure of the nodules will be indicated in studying their mode of formation.

*Mode of Formation.*—In order to study the mode of formation, serial sections of very numerous nodules were investigated. The Weigert preparations were the most useful for this purpose, but silver and Van Gieson sections gave very valuable confirmatory results; the latter being specially helpful in indicating the mode of termination of the fibres. The method adopted was to trace such a nodule as that represented in Fig. 35, stained with Weigert's method, or Fig. 29, stained with silver, both upwards and downwards as long as any trace of it could be noted. The first nodules investigated were those in the above figures, and it will be convenient to take them as representative of a very large number of nodules which could with certainty be confirmed to have a similar origin and extension.

The large wedge-shaped and oval nodules represented in Fig. 35, lying in the pia opposite the ligamentum denticulatum, and extending inwards from the periphery, when traced downwards by means of Weigert preparations, were found to change rapidly. The fibres diminished in the peripheral mass, and the nodule increased in size in the lateral vessel, and, later, was connected with the pia by means of only a few fibres. Lower still these were absent, and the nodule, still in relation to the vessel but diminishing in volume, was found on the border of grey and white matter (Fig. 36). In the next sections it was independent of the vessel (Fig. 37), and its fibres gradually unweaving, as it were, from the nodule mass, became lost in the meshwork of fibres of the grey matter; no definite connection between them could be traced. In the final section, only two or three strands were present, forming a very loose network of interlacing fibres, which in the next section could not be distinguished from the normal fibres of the part. Throughout its course from the periphery the fibres were found intertwined, and there were attempts at whorl-formation with strands of six to twelve parallel fibres.

If this series is traced upwards, it is found that the nodules which lie partly parallel to the periphery of the cord and partly at right angles (Fig. 35) are wholly within the pia—forming one long elongated nodule in the centre, of which at one end a vessel is cut transversely. This elongated nodule shows many parallel strands and intertwining fibres, and can be traced in higher sections nearer and nearer to the anterior roots, the fibres becoming more parallel (Fig. 39) and slightly more deeply stained as the emerging anterior root zone is reached.

Here the appearance of the bundle of fibres conveys the impression that an anterior root bundle, instead of passing directly outwards, has curved round into the pia laterally. Going back on the former figures, we see that it has travelled either in the pial spaces or in the vessel-walls till it had been arrested opposite the ligamentum denticulatum, that it there passes inwards along the lateral vessel, till it reached the zone bordering the grey matter, into the general texture of which it had finally unwound its fibres. The successive stages of this evolution may be followed in Figs. 35-39.

It will be necessary later to note the exact point of origin of these fibres, which could thus with certainty be traced into relation to the emerging anterior root zone. Meanwhile, having indicated that bundles of fibres have passed laterally in the pia from this region, we pass to observe similar bundles passing ventrally in the pia, and curving round the antero-mesial border of the white matter into the anterior fissure.

The large nodule, represented in Fig. 29, stained with Cajal's axis-cylinder stain, when traced downwards, showed that it retained its whorl-arrangement and its size unreduced through several successive sections. This seemed to indicate that it had an elongated spindle-shape rather than a circular form. It then gradually lessened in diameter, and almost suddenly showed a commencing cleft which, in later sections, became almost complete. In each of the two nodules thus formed, there was a small vessel cut obliquely, an indication that the larger nodule had been in relation to a vessel and that this division was due to its branching. The two smaller nodules lasted through only two or three sections, and broke up into radiating fibres just at the border of the grey and white matter. Some of the fibres took the course almost exactly of fibres of the normal anterior root bundles, but none could be traced to the periphery of the cord. These radiating fibres are similar to those described earlier as finely calibred fibres with a pink outline of connective tissue.

If this nodule is traced upwards, it is found that it lessened in volume more rapidly, and in eight or ten paraffin sections had assumed the shape of a wedge in close relation to a vessel. In successive higher sections the commissural vessels, as they curved into the grey matter from the base of the anterior fissure, contained very numerous strands of fine fibres (Fig. 31). These rapidly diminished in number in the anterior fissure, and in higher sections only two strands, composed each of from four to six fibres, could be found, and these were followed in the pial vessels between the anterior fissure and the converging anterior roots. A linking with anterior roots could not be traced in this case, but in numerous others it could with certainty be confirmed that the fibres seemed to emerge in the immediate vicinity of the anterior roots. These, the two first nodules which came under observation, stained respectively for medullated sheath and axis-cylinder, were typical of large numbers of nodules in the grey and white matter.

It is necessary to supplement this description by referring to Van Gieson-stained preparations. These showed that the fibres, immediately on their leaving the region of the anterior roots, had a similar

but more delicate structure and an increased number of nuclei. The pia, especially opposite the ligamentum denticulatum, showed even more fibres than in Weigert preparations. Fig. 22 represents the same nodule as that just traced serially (Fig. 35), and shows the very large number of nuclei related to the fibres. Similar nodules in relation to a lateral vessel (Fig. 20), and to a commissural vessel (Fig. 21), could be followed in a manner exactly comparable to those already described, the strands of fibres in the commissural vessels in successive sections showing the increasing intertwining and nodule formation of Fig. 21.

The pial fibres could thus be stated to arise from the region of the anterior roots, and most probably only from their immediate vicinity. They then pass rapidly, laterally or medially, and during their transition undergo a change in disposition and structure. Becoming more closely intertwined, by the time they have reached the mid-point of the lateral surface they have assumed a nodule formation. The fibres passing ventrally seldom assume this compact form till they emerge from the base of the anterior fissure, but in the region of the central canal they often form a large, dense nodule (Fig. 44). As the fibres pass from the region of the anterior roots they become finer, stain less intensely, and show a very distinct segmental structure, the segments being in the form of bulging cylinders or varicosities with connecting bridges (Fig. 13). The very fine character of the fibres around the vessels at the base of the anterior fissure is well brought out in Fig. 42, where the central vessel is seen dividing, and the fibres pass in later sections along commissural vessels into the grey matter of either side, and along the branches to the anterior (Fig. 41) and lateral (Fig. 43) horns as leashes of fine fibrils.

The fibres do not always pass to the base of the anterior fissure, but sometimes inwards along the lateral branches of the anterior fissure vessels. Fig. 40 shows a wedge-shaped mass of fibres passing into the direct pyramidal tract near its anterior mesial margin. These fibres could be traced along this vessel, ultimately to form the nodule (Fig. 27). This nodule, when traced downwards, broke up into strands of fibres in the meshwork of the grey matter.

The fibres passing laterally in the pia could be traced passing inwards along almost every lateral vessel between anterior and posterior roots. If one section were taken, and attention were concentrated on a strand of pial fibres in relation to the anterior roots, in successive sections that bundle could be followed as has been done above. Simultaneously, moreover, new bundles rise in their place cut transversely or longitudinally, and these, in their turn, can be followed to lateral vessels of the cord. We thus frequently get a radiation of the fine fibres in the peripheral vessels, or indications, marked by a fibrosis of the vessels, that such fibres have been present. The impression is given that if we could restore the picture to an earlier stage intra-medullary fibres in bundles or nodules would radiate inwards along all the lateral vessels to the circumference of the grey matter.

The pial fibres, passing inwards along peripheral vessels, result in

the formation, speaking generally, of nodules within the white matter, and these, running horizontally, have their greatest diameter in transverse sections of the cord (Fig. 35). The fibres passing along central vessels form nodules in the grey matter, and these have their long axis more oblique or parallel to the long axis of the cord (Fig. 29). Strands of fibres also in the pia cut longitudinally, when traced upwards, frequently become more oblique or longitudinal as they reach the anterior roots.

The fibres of the nodules in relation to central and peripheral vessels frequently intermingle. As a rule, by this time a very large nodule has formed at the base of the anterior horn, and from this nodules have branched off, with the vessel branches, to the different areas of the grey matter. When the secondary fibrotic changes, following the nodule formation, have not occurred to any marked extent, a very beautiful interlacing of the fibres or intermingling of fibres from different nodules takes place at the borders of white and grey matter. Such appearances are best understood from Van Gieson sections, where the fibres of each nodule, as it were, become unwound, and the disentangled threads of each nodule intermingle to form an inextricable maze of fibres that break up at their extremities into whorls of individualised nucleated elements. Many of these isolated elements in the loose meshwork are distinctly the cut portions of these terminal strands, but many could be conclusively proved to be isolated fusiform nucleated cells. Sometimes these fusiform elements unite end to end to form chains of cells with imbricating processes (Figs. 45, 46).

In the terminal ramifications of the fibres of each nodule all the transitions between nucleated fibres, chains of nucleated cells, and nucleated fusiform cells could be followed. The calibre of the nucleated fibres is greater than that of the fibres with which they are in continuity (Fig. 45). In each nucleated fibre there can be recognised a distinct axis-cylinder, a homogeneous yellowish-green surrounding layer, with a fine pink outer border. In the fusiform elements forming the chains are darkly stained elongated nuclei, and a homogeneous—with polychrome-thylene blue—slightly granular protoplasm, and in some a faintly stained filament can be definitely demonstrated lying along one side of the nucleus or extending from its opposite poles. This appearance was more evident in preparations from the medulla and pons, and its significance will be dealt with in discussing the nodules in these regions.

In the structure of the compact nodules we noted that there was little interstitial tissue, but here, in the breaking up of the nodules, the fusiform elements were intermingled with an increasing fibrosis. As these elements scatter in this fibrous tissue they become more and more unrecognisable, and progressively may be confounded with connective tissue elements. It is only when this fibrosis is absent or very slight that the specific nervous nature of the nucleated chains and fusiform cells can be recognised.



(c) *Origin of the Fibres forming the Nodules.*

The majority of the nodules, it has just been stated, can be traced to fibres passing ventrally or laterally from the immediate vicinity of the emerging anterior nerve roots. It will now be necessary to discuss one or two points which are of importance in relation to the possible precise point of origin of the pial fibres so traced.

Obersteiner thus describes the histological structure of the posterior root where it enters the cord: "At the point where the posterior root pierces the pia mater it is constricted, and sometimes to a marked extent." "This reduction in size takes place entirely at the expense of the myelin sheath. Consequently, when stained by Weigert's method, the root at this point remains colourless, and a bright band, usually convex on the outer side, is seen traversing the root at the point of constriction." Levi has shown that the posterior root fibres lose their neurilemma sheaths and become imbedded in neuroglia within the spinal cord in the cervical segments, just as they enter the cord in the dorsal segments, but outside the cord in the lumbo-sacral segments. He has further shown that the *Aufhellungzone* or *Ablassungzone*—the zone which stains so palely with the Weigert method—coincides with this transition line, and that here the fibres become narrowed to form the so-called "constriction zone" or ring of Obersteiner. Levi, Orr, and Rows, and others have looked upon this point as the "locus minoris resistentiæ" of the fibre, and have ascribed to it considerable importance in the pathogenesis of tabes.

A similar *Ablassungzone* has been scarcely recognised for the anterior nerve roots, but Orzechowski in a case of tabes, with the development of numerous pial neuromata, found that the abnormal pial fibres were present only in the lumbo-sacral segments, and almost exclusively in the neighbourhood of the anterior roots. He noted that the position of the *Ablassungzone* in the anterior roots changed in different segments, even of the lumbar and sacral cord, and that all the abnormal pial fibres could be traced to arise from that point of the anterior root fibres peripheral to the *Ablassungzone*, wherever it might be situated. As a rule, it was in the deeper layers of the pia or just at the boundary of pia and the glia border layer.

A very prolonged study of our preparations at all the levels of the cord was carried out with the view of tracing, if possible, the point of connection of the fibres, the intimate association of which with the anterior roots at once suggested their origin from them.

In numerous segments in which the secondary fibrosis had not too greatly involved the intra-medullary course of the fibres, it was found that the emerging anterior nerves, before reaching the pia, show at a definite point of their course a faintly staining zone (Fig. 48). At this point there is a considerable attenuation, possibly even an interruption, of the myelin sheath. That this is not due to over-differentiation is proved by the staining of the fine abnormal fibres gathered together in the pia. This transition zone differs from that in the posterior roots (Fig. 47) in that it is not a constriction zone, for the fibres of each group pass parallel through the *Ablassungzone* before they radiate into

the root bundle. Further, the point where the myelin sheath becomes attenuated is not the same for each group of fibres, so that a line passing through the *Ablassungzone* of the anterior roots in any one section is a widely-extended and undulating one.

In the upper cervical segments this *Ablassungzone* was almost invariably found entirely within the glia border layer, or just on its intra-medullary border. In the dorsal cord, in those segments sufficiently healthy to allow it to be traced, it was found just on the borders of glia border layer and pia. In the lumbo-sacral cord the increasing fibrosis in the emerging root zone made it difficult to determine with certainty any regularity in its position. But it could be proved to be an irregular line sometimes within and sometimes without the outer border of the glia border layer.

In consequence of the existence of this *Ablassungzone* the intra-medullary part of some anterior nerve roots is divided into a central and peripheral part. The root bundles outside the pia are cut transversely, so that the emerging roots would seem to take very rapidly a course in the longitudinal direction of the cord. The anterior nerve bundles have thus a central part, an *Ablassungzone*, and a peripheral part. By the varying position of the *Ablassungzone* the length of these portions of the nerve is altered. If it lies within the glia border layer, then the peripheral part is lengthened, and if it lies in the pia the peripheral part is very short.

In Weigert-stained preparations, amongst the thick root fibres—those immediately peripheral to the *Ablassungzone*—small bundles of fine fibres could be traced, either free or disposed around the vessels. The anterior root artery, cut transversely immediately lateral to the nerve root, was almost invariably in the lumbar cord surrounded by a reticulum of fine fibres (Fig. 13). A passage of fibres from anterior roots to this vessel could never be traced, for an anterior root bundle seemed to divide and enclose the vessel. In other preparations the *Ablassungzone* of one bundle was unrecognisable and its place was taken by a fibrosis, within which could be traced an interlacing of fibres which were finer than the intra-medullary fibres with which they appeared to be continuous. From this interlacing, in which fibres were cut transversely and longitudinally, there seemed to be a definite gathering up of fine fibres to pass into the pia. A very clear picture of such a group of fibres passing laterally is seen in Fig. 39. A careful comparison of numerous such pictures made it not unreasonable to assume that here the *Ablassungzone* had been intra-medullary, and that from the point immediately peripheral to it the pial fibres had arisen, the secondary fibrosis involving the intra-medullary course of the fibres.

The direct association of the abnormal pial fibres with the anterior nerve bundles immediately peripheral to the *Ablassungzone* seemed to be confirmed by further study of the preparations. The connections were often very few, but they must often have been removed by the increasing fibrosis.

It must further be noted that the fibres of several nodules, situated

midway between the grey matter and the periphery of the cord, seemed as if they unwound into strands directly continuous both centrally and peripherally with anterior root bundles. A careful examination, however, of serial sections made it evident that such nodules also had formed in relation to vessels passing into the cord alongside the emerging nerve bundles, and that the nodule formation took place just as in relation to other lateral vessels. The close proximity of the emerging fibres to the nodule made it appear as if they entered into and emerged from the nodule. On several occasions, however, the emerging strands showed a definite tortuosity in their course.

According to Nageotte, the *Ausgangspunkt* of tabes is formed by an area of transverse neuritis, situated near the point where the roots penetrate the dura. It has already been pointed out that a retrograde degeneration may occur in the anterior roots and that from the point where this may be arrested the anterior roots may regenerate new fibres. If this degeneration ascend to the point where the neurilemma sheath is lost, the new fibres tend to stray into the pial spaces and vessels and to form neuromata, instead of passing onwards in the old sheaths of Schwann to form leashes of young fibres in the degenerated tube.

A careful examination of the cord throughout its whole extent has proved the almost entire absence of any degeneration in the extra-medullary portions of the anterior nerve roots. The nerve roots were retained in most of the segments, especially in those in which the nodules were most numerous, and the pial fibres emerging laterally and medially from the vicinity of the emerging zone were in no way associated with an extra-medullary retrograde degeneration arrested at the point peripheral to the *Ablassungzone*. A regenerative process, in the sense of Nageotte's findings in tabes, can, therefore, not be assumed as an explanation of the pial fibres.

In only one funiculus of the extra-medullary anterior roots was an appearance noted which might be interpreted as a regeneration of new fibres within the old sheaths of Schwann: this passed through several successive sections. It must, however, be stated that the radicular portion of the root was not examined, but, were a retrograde degeneration to be accepted as an explanation of the new pial fibres, it must of necessity have extended to the *Ablassungzone* and been evident in the retained roots. It must further be mentioned, ere leaving this question of the relation of the precise point of origin of the abnormal pial fibres, that the intra-medullary portion of the anterior roots frequently showed a myelin degeneration. This process was secondary to the fibrosis accompanying the nodule formation and will be referred to in a later section.

#### (d) *Distribution of the Neuromata.*

It has already been noted that with the exception of the upper five cervical and the 2nd and 3rd dorsal segments, no part of the cord was free from nodule formation. The first indication of such in the

6th cervical segment occurred as a very small nodule in relation to a vessel of the anterior roots. The few fibres composing this nodule could be traced in serial sections to fibres passing in from the periphery along this vessel, and in subsequent sections the nodule broke up into fibres within the general substance of the grey matter. The normal structure of the white and grey matter was retained, but at the postero-lateral angle of the anterior horn a slight amount of fibrosis indicated that nerve fibres had been present: under high power this was confirmed, as ghost-tubes could be distinctly recognised as nerve fibres. In the opposite horn, at each angle, antero-mesial, antero-lateral, and postero-lateral, a similar change had evidently occurred, and the vessels leading to these points from the periphery showed a commencing fibrosis. It was evident that fine fibres had passed, in the adventitia of these vessels, to the angles of the grey matter and had there broken up, to disappear finally with the onset of the fibrosis. With the exception of this very minute nodule and the indications that other abnormal fibres had been present, this segment was quite normal. The pia showed a few fibres cut transversely and obliquely, and there was a certain amount of infiltration of the pia and of the vessels of the cord, especially of the grey matter, with lymphocytic-like cells.

In the upper part of the 7th cervical segment the nodule formation had already become much more evident. A large pear-shaped nodule was present in the centre of the anterior horn on one side: this extended through nearly twenty paraffin sections, and several of the vessels distributed in the grey matter show leashes of fine fibrils in their walls. Throughout both this and the next segment, almost every section showed beautifully that most of the vessels in the grey matter contained these delicate fibres. Figs. 10-12 and 29-33 are all taken from these two segments, in which the nodule formation had taken place more in relation to the central than to the peripheral vessels. In the adventitia of the vessels, silver preparations revealed a fine plexus of fibres with numerous lateral branches and fine terminal bulbs or clubs (Figs. 10, 12): only a few ring-forms could be traced. These appearances must be looked upon as equivalent to Cajal's *cônes* and *anneaux*. When a vessel bends or divides the leash of fibrils in its walls curves round or branches off along the two divisions (Fig. 33). In relation to many of these nodules, the secondary fibrosis had involved specially that part of the anterior horn bordering the white matter. Weigert-stained preparations also showed that there was an involvement of the myelin of the intra-medullary anterior roots, but silver preparations brought out the integrity of the axis-cylinder (Fig. 34).

In the 1st dorsal segment there was a return to the more normal architecture of the cord, with a few more or less isolated nodules and a commencing fibrosis involving the terminal ramifications of the fibres of the nodules. The 2nd and 3rd dorsal segments were practically normal with the exception of the slight sclerosis to be noted later.

The segments from the 4th dorsal to the 1st lumbar inclusive

showed a very uniform change, uniform in character though not in degree. At numerous levels the only nodules present were found in the centre of the grey matter in the form of an extensive plexus round a vessel as its centre. In other sections, leashes of fibres could be traced from such nodules along all the vessels to the circumference of the grey matter—passing to anterior and lateral horns and to Clarke's column. Even where the structure of the cord was retained, there was an indication of fibrosis in relation to the nodules, and as this advanced the nodule gradually disappeared, leaving only a few fine fibres around a vessel. Pial fibres are present, in limited numbers, around the whole lateral cord: and a few nodules could be traced in the pial septa.

The lumbo-sacral cord proved to be a perfect store-house of neuromata. Nodules could be traced in every preparation without exception, and the histological picture, formed by the combined nodule formation, the accompanying fibrosis, the sclerosis, and the fibrosis of the intramedullary course of the anterior and posterior roots, changes not only in every segment but in every section. Throughout this region the pia also was perfectly black, in Weigert-stained sections, with fibres cut longitudinally, obliquely, and transversely, and with almost every vessel there was a radiation inwards of fibres and more or less marked nodule formation or indications that such had existed. The anterior fissure showed numerous strands of fibres, which were continued in the walls of the commissural vessels to the base of the anterior horn, where they formed a very large nodule from which several smaller nodules branched off along the different vessels. There was frequently, too, a coalescence, at the junction of white and grey matter, of fibres of the nodules in relation to central and peripheral vessels.

In the 2nd sacral segment, the region of the central canal was occupied by a large nodule composed of closely disposed fibres with numerous nuclei (Fig. 44), and on either side the central vessels showed small nodules in the connective tissue surrounding them. The grey matter of the antero-mesial and antero-lateral groups of cells on one side was also occupied by a dense, compact nodule, from which fibres radiated to intermingle with fibres formed in relation to the peripheral vessels. The nodule in the region of the obliterated central canal passed through the whole of the remaining sacral cord; from it fibres radiated in all directions into the grey matter. In the pia were numerous strands of very delicate fibres, but no further nodules could be traced.

## (2) FIBROSIS ASSOCIATED WITH THE NODULES.

The neuroma formation was not the only pathological process present in the cord, nor was it the most dominant feature. Throughout the pia it has been noted that there was a definite thickening and at numerous levels a marked cell-infiltration, the whole suggesting that at one period there had existed meningitic processes. This process had spread along the adventitia of nearly all the vessels of the antero-lateral cord, and was specially marked at the base of the anterior

fissure. The posterior roots were similarly involved in the posterior root-entry zone throughout almost the whole extent of the cord, and the anterior nerves in the intra-medullary root-emergent zone at numerous levels. The upper five cervical and 2nd and 3rd dorsal segments were alone free from this change, and even they, in the 5th cervical and the dorsal segments, showed the change in the posterior root-entry zone to a slight extent.

The question of the sequence of the pathological processes naturally at once arises in the mind. Schlesinger related the neuromata in his cases to a proliferative process, the result of a long-continued chronic irritation. There is abundant evidence of such a chronic irritation in this case, but a prolonged study of individual segments confirmed the first impression that the fibrosis was secondary to the nodule formation. Every nodule, almost without exception, could, by means of serial sections, be definitely related to a vessel. In segments such as the 6th cervical and 1st dorsal, where individual isolated nodules were present and the normal structure of the cord was otherwise retained, the nodule formation was the only abnormal appearance. Such isolated nodules were lying within the adventitia of medium-sized vessels, the walls of which were scarcely altered in structure (Fig. 6). Other sections showed similar nodules, with a commencing thickening of the vessel-wall, not only of the vessel in which the nodule was present, but to a lesser extent of all the vessels of the cord. The lower part of the 6th cervical segment in Weigert-fuchsin preparations gives the appearance, under low power, of a normal cord with the vessels, even the capillaries, markedly prominent, owing to the slight thickening of their walls. At a slightly lower level, where a small nodule is evident on one side and a few abnormal strands on the other, the angles of the grey matter are picked out by a commencing fibrosis.

When we pass to the 7th and 8th cervical segments, where the nodule formation in the anterior white matter is marked, this stain shows diffuse pink areas, within which are strands of myelinated fibres, many of which are on the point of disappearance even with the most careful differentiation. A comparison of numerous sections shows that these areas of fibrosis are associated with the breaking up of nodules, and that these have been first involved in, or have at least first yielded to, the compression of the increasing fibrosis and the influence, toxic or otherwise, which first called it into play.

In such sections, when the fibrosis is not sufficiently dense to have involved all the structural elements, there is present a meshwork of fine fibres which suggests the presence of capillaries running in all directions. These are, however, finely calibred bands, recognised as nerve fibres by the yellowish staining of their protoplasm, the occasional faint trace of axis-cylinder, and the fact that they never contain any red blood cells.

With the increasing fibrosis the pia, pial septa, and grey matter all show an intense perivascular infiltration with cells, whilst in the areas of fibrosis such cells form small accumulations and extend into the surrounding nerve tissue. Most of these cells are of the lymphocyte

type, with a darkly staining nucleus in which no definite structure can be recognised, and with a very narrow zone of protoplasm. Some cells, slightly larger than these, are also present, with an oval nucleus, placed to one side, in which the chromatin network can be recognised, especially with polychrome methylene-blue staining. A few plasma cells, with characteristic *radkern* nucleus and metachromatic-staining protoplasm, are scattered amongst the other cells.

*Glia Cells.*—In the zone of extension of the fibrosis, an intense glia-cell proliferation and hyperplasia have occurred (Figs. 7 and 49). The cells contain oval or irregular nuclei, which are much larger than those in normal glia cells and are situated at the periphery of the cell. The nucleus stains darkly but the chromatin network is distinct, with large nodule points, often a distinct nucleolus, and always a sharply contoured membrane. The protoplasm varies in amount: in the smaller cells it is homogeneous, of very varied shape, and with very fine processes; in the larger cells it assumes an angular or star-like form, and from the angles pass thick ramifying processes which form a network enclosing in its meshes numerous lymphocyte cells. Many of the glia cells are in close relation to vessel-walls, especially capillaries. It is in this zone of advancing fibrosis that there are found elements the interpretation of which tends to cause considerable confusion (Fig. 7). The young fibroblasts are in appearance very similar to the fusiform cells which arise from the terminal ramifications of the nucleated tubes, especially as the latter undergo a fibrous transformation.

*Ganglion Cells.*—To a remarkable extent the ganglion cells were preserved in the grey matter, which had not been encroached upon by the fibrosis advancing from centre and periphery. The majority of the cells were altered in character, but many apparently healthy cells were present. In other sections few of the cells failed to show changes: chromatolysis in all stages, from a slight central or peripheral removal of Nissl's granules to their entire absence, vacuolation of the cytoplasm (Fig. 50), eccentric position of the nucleus, and all stages of atrophy of the cells. A few cells were found which, even with very complete differentiation, showed a diffuse staining and fusion of the granules.

Throughout the whole dorsal cord below the 3rd dorsal segment, this fibrosis is present to a greater or less extent. Sections at various levels show that the central canal is involved and that the change has extended to the commissural vessels on either side, thence to the centre of each grey matter, from there has passed forwards to the anterior horn, outwards to the lateral horn, and backwards to the posterior. When this fibrosis was very marked the grey matter in Weigert-fuchsin sections was picked out in pink. In the adjoining lateral and in the posterior columns there was a varying degree of sclerosis with markedly fibrosed vessels. The posterior columns showed also a striking degree of fibrosis in the posterior root-entry zones. From this severe degree of involvement of the grey matter there were

all transitions to the sections which showed only a slight nodule formation and only a trace of commencing fibrosis.

It is when we reach the second lumbar segment that the probable sequence of the processes becomes evident. Weigert-fuchsin sections at this level (Figs. 51 and 52) show on both sides finer or thicker fibrous strands passing from the periphery of the cord to the borders of the grey matter, there to expand into a loose meshwork of pink-stained fibres and not involving to any marked extent the grey matter, the cells of which stand out clearly. In the *formatio reticularis*, on one side, there is a very evident area of fibrosis, with the remains of a nodule, the connections of which with the periphery can be traced even in the thickened lateral vessel. On the opposite side (Fig. 52), a dense area of fibrosis occupies the base of the anterior horn, stretches amongst the antero-mesial group of cells and laterally to the posterolateral group, where the remains of a whorl of fine fibres may still be recognised. Pial septa and vessels throughout the segment show a very marked thickening.

Similar changes are present in relation to all the nodules throughout the lumbo-sacral cord, the variations depending on the extent and distribution of the fibrosis. A symmetrical involvement of the grey matter on opposite sides is frequent, and a similar symmetry has been noted in relation to the lateral columns, which were often mapped out by fibrous strands. In the 3rd lumbar segment the markedly thickened vessel represented in Fig. 16 can be traced throughout its whole extent from the anterior fissure, curving into the grey matter, and passing to the neck of the posterior horn. In its course it is surrounded by dense masses of deeply-staining round cells, and a small area of calcification was associated with this accumulation. Below the 5th lumbar segment, the secondary involvement of the strands and nodules was very much less marked.

### (3) FIBROSIS OF THE INTRA-MEDULLARY PORTIONS OF THE ANTERIOR AND POSTERIOR NERVE ROOTS.

This change in relation to the anterior nerve roots was constant throughout the lumbo-sacral cord, was very irregular in the dorsal cord, and was again present in the 7th and 8th cervical segments. In the anterior root-emergent zone the divergence peripheralwards of the bundles of fibres was much wider than the normal: definite bundles seemed to pass to the antero-mesial angle of the anterior columns and even posterior to this angle, and emerging bundles radiated outwards to a point considerably more than half way to the *ligamentum denticulatum*. The whole of this root-emergent zone was involved at certain levels in a fibrosis which gave to longitudinal fibres a deeply-staining pink outline, and to transverse fibres just within the pia a sharp pink contour, for each individual fibre was separately enclosed. The myelin sheath of such fibres was frequently degenerated as far as the fibrosis extended, but silver preparations showed that the axis-cylinders were preserved. This accounts for the absence of degeneration in the extra-



medullary portion of the anterior roots in spite of the degeneration within the cord. Sometimes the whole anterior root-emergent zone showed this change; at other times only individual bundles of fibres (Fig. 54), along each of which it seemed as if the neurilemma, together with a layer of the pia, had been continued inwards. The extra-medullary portion of the root did not share in this fibrosis.

The change in the posterior roots was even more striking and constant. Fig. 53, taken from the 7th cervical segment, shows that the fibres forming the compact bundle of the posterior nerve root give no indication of a constriction zone, but are continued within the cord for a considerable distance, retaining their neurilemma sheath and nucleus and, as in the anterior roots, carrying in, as it were, round each fibre a layer of the pia, with which the neurilemma sheath usually blends at the ring of Obersteiner. Individual fibres can be traced through the posterior root-entry zone almost to the edge of the posterior horn, and reflex collaterals, with this structure, as far as the base of the anterior horn. The extra-medullary root gives the impression of having been carried right into the cord substance and, intra-medullary, differs only in showing an increased interfibrillar tissue with more numerous nuclei. Between, and on either side of, the longitudinal entering strands cross-sections of fibres show an involvement in the fibrosis, as if fine fibrils of connective tissue had enclosed them in a reticulum. An area of the posterior columns, with nucleated fibres mostly cut transversely, is situated almost invariably just to the inner side of the fibrosed root-entry zone.

In longitudinal sections of the cord, the entering posterior root fibres can be traced for fully one centimetre: the fibres show neurilemma sheath and nucleus and an increased interfibrillar tissue. The nuclei in relation to the fibres tend to assume a position actually within the contour of the nerve fibre, and the nucleated fibres end in direct continuity with normal non-nucleated fibres of the posterior columns. No definite fusiform elements could be traced in relation to the terminations of these nucleated fibres.

Weigert-fuchsin preparations show that very many of the fibres in the posterior root-entry zone and in the areas mesial to it are degenerated; in some nerve fibres only a faint shadow of myelin is present. That this again was not due to over-differentiation was proved by the presence of the very fine fibres in the pia immediately anterior to the posterior roots. Under low power, the posterior root-entry zone stood out clearly as an area of diffuse fibrosis, continuous with an oval area immediately internal to it, which was probably the continuation upwards of the root-entry zone of lower levels.

The 5th cervical segment showed only a slight trace of this fibrosis in the posterior root-entry zone, but in the area internal to it were numerous nucleated fibres, each with a delicate pink zone. In these nucleated patches the normally situated glia cells were very much enlarged, and the thickened, ramifying processes formed a fine network around the fibres, the nuclei of which could be distinguished from glia nuclei by their intimate relation to the axis-cylinder.

It is important to note that though so many of the fibres in the intra-medullary portion of the posterior roots showed degeneration, there was no attempt at a regeneration from the healthy extra-medullary portion. None of the fibres in the lateral pia could be traced directly to posterior roots, nor could any definite connection be established between posterior roots and the few pial fibres in the posterior pia and pial septa. Nageotte, as we have seen, has described in tabes a collateral regeneration from the preserved end of the posterior roots, and Raymond traced the fibres of the neuromata, found by him in the posterior pia, to a regeneration of posterior root fibres interrupted in their intra-medullary course. An explanation of this absence of regeneration may be found in the integrity of the axis-cylinder as revealed by the silver method.

#### (4) SCLEROSIS.

Areas of sclerosis are here distinguished from areas of fibrosis, though the latter frequently extended so as to involve the former. We may here confine ourselves to a reference to those areas in which no marked fibrosis accounted for the change, *i.e.*, areas in which the normal framework of the cord structure was retained. Such areas of sclerosis had many of the characters of areas of degeneration in disseminated sclerosis. Though the same columns were affected in nearly all the levels of the cord, this was in such varying proportions, and separated by intervals in which no transition could be traced, that the significance of ascending and descending degeneration could not be ascribed to the degeneration. A further similarity to disseminated sclerosis existed in the presence of the thickened vessels on transverse and longitudinal sections, and further, in the presence, in varying proportions, of naked axis-cylinders. No compound granular cells were found in the sclerosed areas, an indication that the process of sclerosis had run its course some time previously.

In the upper cervical segments there was slight degeneration of the column of Burdach near the median septum—frequently lozenge or spindle-shaped; the tracts of Gowers and of Flechsig were also slightly sclerosed to an extent coinciding with the posterior column degeneration, and there was distinct degeneration in the tract of Helweg on one side. In the lower cervical segments there was a slight tendency to degeneration in the direct pyramidal tract on one side, and the crossed pyramidal on the other, and again slight degeneration in postero-mesial columns, tracts of Gowers and of Flechsig. Throughout the various levels of the dorsal cord, there was a very definite area of sclerosis between the tract of Gowers and that of Flechsig on both sides, together with a slight degree of degeneration in the columns of Burdach adjoining the median septum. Throughout the lumbo-sacral region, the fibrosis was so extensive in the white matter that it was impossible to distinguish areas in which sclerosis may have been present independent of the fibrosis, except in the

postero-mesial columns, which again showed slight degeneration near the median septum.

In some parts of the cord in the posterior columns there was a remarkable twisting of the fibres. The fibres seemed to twine round upon themselves and to run, as it were, around an irregular axis parallel to the longitudinal axis of the cord, and then in successive serial sections the normal orientation of the fibres was re-assumed. Such appearances were accompanied by a rarefaction of the tissue, not amounting to even slight sclerosis. Similar appearances have frequently been noted in the posterior columns in cases of disseminated sclerosis.

## 2. MEDULLA OBLONGATA AND PONS.

As a preliminary to a description of the nodules in the medulla oblongata and pons, it is necessary to state that they were definitely distinguished from the nodules in the spinal cord in that the fibres composing them stained specifically neither with silver nor with the Weigert method, and, further, that only in one or two isolated instances did the fibres assume a whorl-arrangement. So different were the nodules that for a time it was assumed that a pathological process was in operation essentially distinct from that in the spinal cord. The finding, however, of one or two nodules with definite whorl disposition of the fibres, presenting, as it were, a transition to the more fully developed nodules in the cord, led to the possibility being entertained that these formations were early stages in the development of one process. Later findings also emphasised the nervous nature of the constituent elements of the early nodules.

The examination under low power of Weigert-fuchsin and iron-haematoxylin-fuchsin preparations at different levels of the medulla and pons showed that the fibre-tracts were here and there interrupted and replaced by small patches which took a diffuse faint connective-tissue stain to a greater or less extent; in these areas, under a higher magnification, faint lines could be recognised taking the myelin stain. In similar sections stained with the Bielschowsky-Williamson silver method, the fibres were again interrupted by faintly staining areas in which were found diffusely staining fragments of axis-cylinders, and in adjoining sections stained with Van Gieson's method it was demonstrated that these areas which had stood out so clearly under a low power as patches

of degeneration were in reality patches of nucleated fibres and nucleated elements cut transversely, obliquely, or longitudinally. The fibres, in many instances, seemed to retain the normal arrangement of the fibre strands of the part involved (Figs. 57 and 58). In other parts the fibres terminated in a loose meshwork of interlacing, nucleated fibres, or strands of such nucleated fibres ended in a vortex of elongated nucleated elements which diverged from each other to interlace with similar elements from adjoining strands (Figs. 59-62). Such areas showing this loose structure were in all instances closely related to the tissue around blood vessels. The iron-haematoxylin stain very readily revealed the existence of even the smallest nucleated patches, as it showed the break in the continuity of the normal fibres, and, further, the minute nuclear structure of the elements replacing them could be ascertained in one and the same section.

In the pia a few fully stained medullated fibres around vessels were found, but in no case did these form strands or nodules in the vessels or pial spaces. Obersteiner has observed that the cranial pial vessels usually contain such fibres, while the spinal pial vessels rarely do so.

From this brief description it is seen that there are present in the medulla and pons abnormal formations which bear a certain structural resemblance to one another. For purposes of description we distinguish between the following:—

- (1) The simplest nucleated patches with the retention of the normal framework of the tissue;
- (2) The patches in relation to sensory nerve paths;
- (3) The patches which consist of a loose meshwork of interlacing nucleated fibres and spindle-shaped elements;
- (4) The definite nodule formation;
- (5) The areas in relation to the superficial origin of motor nerve roots;
- (6) The areas of pure fibrosis.

#### DISTRIBUTION OF THE PATCHES AND NODULES.

It will be convenient at this point to indicate the general distribution of the patches and nodules at different levels. Only

these have been represented in the figures that were readily recognisable under a low magnification in Weigert-fuchsin or iron-hæmatoxylin sections.

#### LOWER PART OF MEDULLA OBLONGATA—"A."

Four well-marked patches are to be found on examining sections at this level. The smallest of these is situated in the mesial line in the centre of the space bounded posteriorly by the two nuclei of the hypoglossal nerves and anteriorly by the two posterior longitudinal fasciculi, between which it extends for a short space. A second patch is situated at the lateral surface of the medulla, just anterior to the descending root of the 5th nerve, and appears to involve some of the fibres of the direct cerebellar

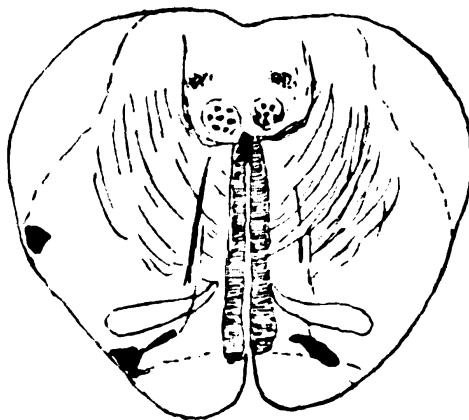


FIG. A.

tract which pass backwards into the restiform body at this level. This patch is triangular in outline, the apex being directed inwards. The remaining two patches lie between the pyramids and the lower end of the inferior olivary nucleus, one lying close to the surface of the medulla, the other about the middle of the posterior surface of the pyramid. These two patches thus involve the fibres of the hypoglossal nerve as they pass between the inferior olive and the pyramids on their way to the surface of the medulla.

#### MIDDLE OF THE MEDULLA OBLONGATA—"B."

The number of patches has greatly increased at this level. Two well-marked examples are to be found in each restiform body,

all being quite superficial in position. The remaining patches may be considered in relation to the inferior olivary nucleus. A narrow elongated mass is to be seen between each olive and the corresponding pyramid, the strands of the hypoglossal nerve on each side being thus involved, and appearing to pass through these patches. Other two are situated at the postero-lateral angle of

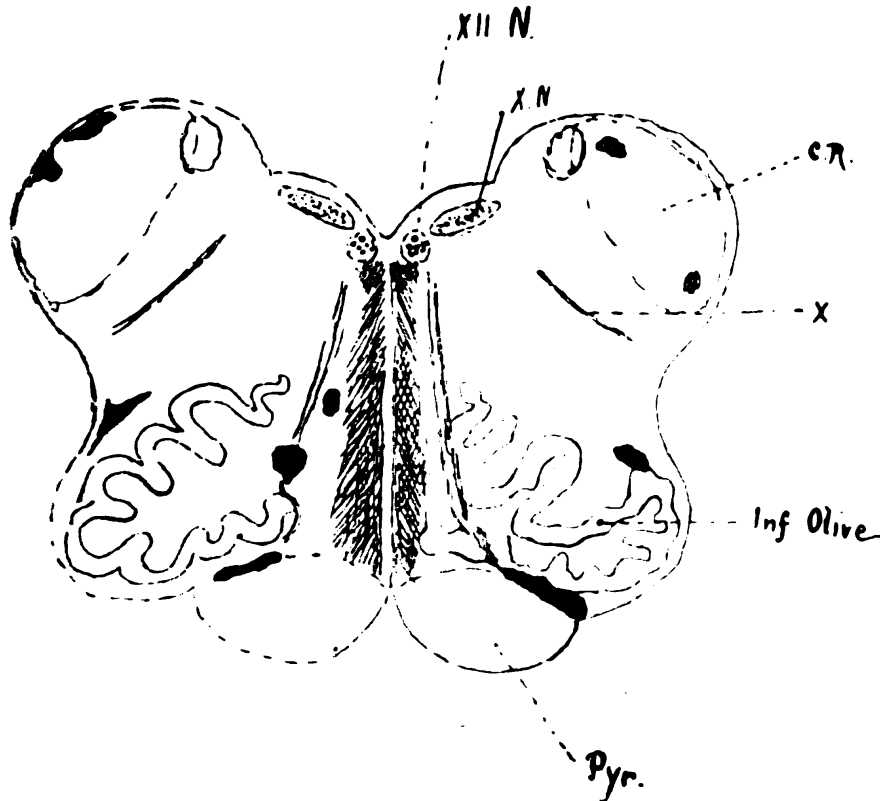


FIG. B.

the inferior olive, touching the grey matter itself, while two further patches lie between the two arms of one olive just at the hilum and directly intercepting the strands of the hypoglossal nerve, where they pass between the mesial fillet and the olive, the hypoglossal nerve on one side, therefore, being interrupted by three such patches.

#### MIDDLE OF PONS VAROLII—"C."

The most important patches at this level lie in relation to the fibres of the 5th nerve at their point of entry, both nerves being

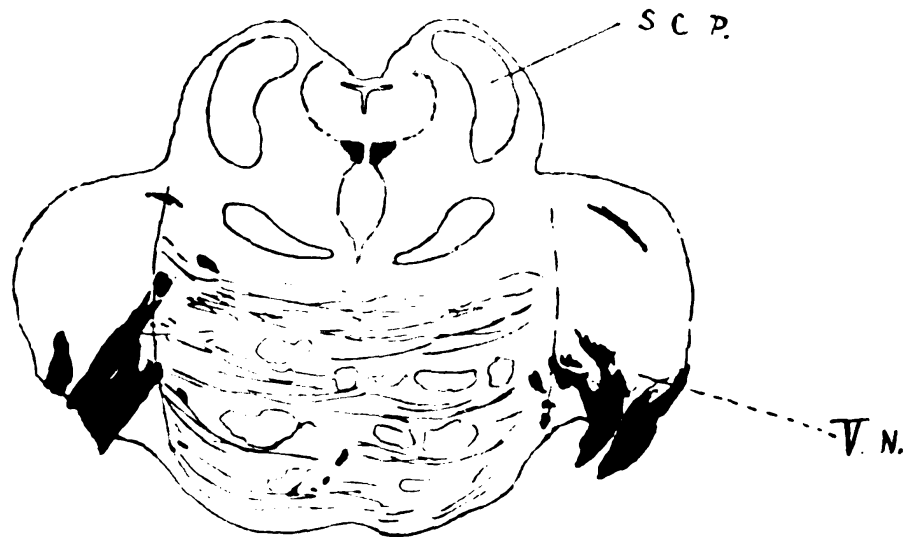


FIG. C.

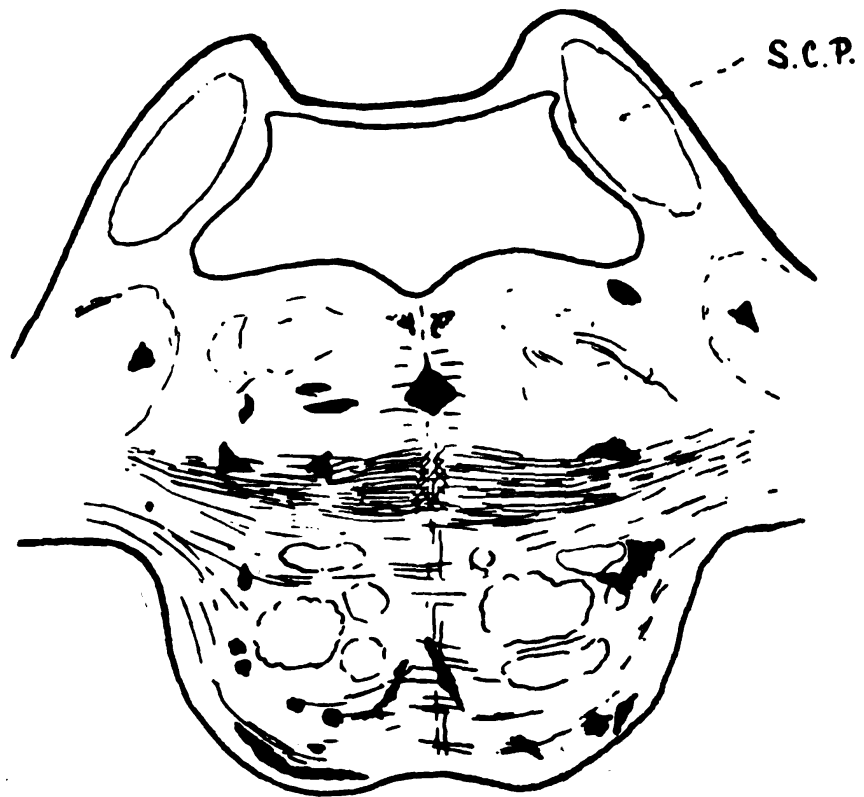


FIG. D.

approximately equally affected. The smaller patches are also visible in the neighbourhood of the lateral fillet upon one side, and a number of smaller ones may be detected amongst the transverse fibres of the pons towards their more superficial bundles. A narrow elongated patch is also to be seen amongst the deeper parts of the fibres on one of the 5th nerves.

#### UPPER PART OF PONS VAROLII—"D."

The number of patches has increased very greatly at this level, no fewer than twenty-one being found in one section. The largest of these is lozenge-shaped and is situated in the middle line anterior to the posterior longitudinal fasciculus, and midway between it and the trapezium. Within the fibres of the trapezium itself, three smaller patches may be detected, and still other three, also small in size, lie in the reticular formation, just posterior to the trapezoid fibres. Another is found at the cerebello-pontine angle. The remainder are scattered throughout the transverse fibres of the pons, mostly amongst the more superficial of these fibres, but not limited to them. Their exact positions may best be seen from the accompanying figure.

#### UPPER LEVEL OF MESENCEPHALON—"E."

The patches at this level are very few in number, and are limited to the region of crus cerebri, only one of which is affected.

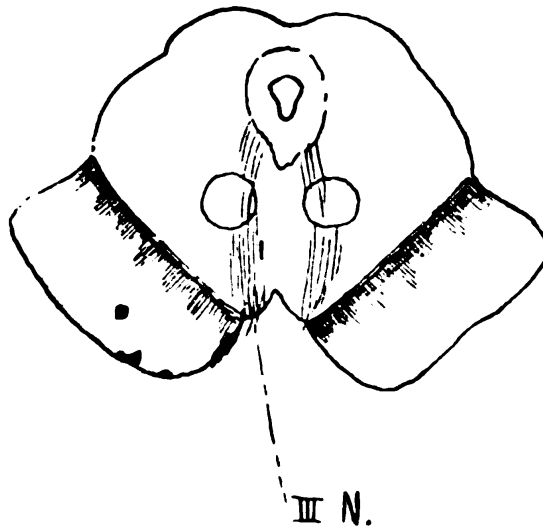


FIG. E.



The largest patch implicates the fibres of the 3rd nerve just at their point of emergence, the area affected being, however, slight in comparison with the corresponding involvement of the 5th nerve as already described. Several smaller and superficial patches are situated towards the inner part of the crus, while a single isolated one, also small in size, is to be seen at a little depth from the surface, and probably implicating pyramidal fibres.

#### (1) ISOLATED NUCLEATED PATCHES.

It is necessary again to emphasise that it is such patches which show a break in the continuity of the myelin staining fibres. They are of two kinds: (a) Those of the first are small in size, isolated, few in number, and are in no way related to the paths of cranial nerves within the medulla or pons; (b) those of the second are more numerous, often extensive, and definitely on the paths of nerves from or to their superficial and deep origin.

(a) In the smallest patches we note that two or three normally staining longitudinal strands, composed of a very few fibres, *e.g.*, in the transverse fibres of the mesial fillet, are interrupted in their course by nucleated fibres which seem to be continuous with them. The nuclei in these fibres are elongated, with their longitudinal axis parallel to the long axis of the tube; they stain darkly, have no nucleoli, and are definitely within the lumen of the tube. The transversely cut strands, between and immediately in relation to the nucleated fibres, are also nucleated, so that under low power we have the picture of the normal transverse and longitudinal strands of fibres for a short part of their course showing nuclei. Under a higher magnification it is recognised that a distinct break occurs on either side of the nucleated fibres, between them and the normal fibres, and that in this short interval only glia fibrils are present. These can be definitely followed right through the patch, retaining and probably maintaining the longitudinal direction of the fibres. A careful analysis of sections stained with Van Gieson's, iron-haematoxylin, and Bielschowsky's methods, when this last method has not stained electively and glia fibrils take the stain, proves conclusively that the glia fibrils in these patches are retained and serve to form channels, as it were, for the nucleated fibres.

The elongated nuclei are definitely within the fibre contour and can be readily distinguished from the rows of small round nuclei so frequently seen in relation to the transverse fibres of the fillet and transverse fibres of the pons. The longitudinal fibres stained yellow-brown with Van Gieson's method, and no distinct central filament was recognised. The transversely cut fibres showed a similar structure, a faintly yellow-brown disc and a reticulum of glia fibres encircling it: the circular nuclei in relation to the fibres showed their identity, in structure and staining, with the elongated nuclei.

Such is the structure of those simplest nucleated patches; they could be recognised as retaining this structure through only a few serial sections, and almost without exception they were in relation to the transverse fibres of the mesial fillet or transverse fibres of the pons near the median raphe.

(b) The nucleated patches next to be described with fibres cut transversely (Fig. 58) and longitudinally (Fig. 57) are of an entirely different nature. They were all found in relation to strands of the sensory cranial nerves, and it will be convenient to describe them with the next group of changes.

## (2) CHANGES IN RELATION TO THE INTRA-MEDULLARY COURSE OF SENSORY ROOTS.

A reference to Fig. 56 shows that the entering strands of the 5th nerve are, for a considerable part of their course within the pons, nucleated. Symmetrical changes were found in the 5th nerve on the opposite side and in relation to strands of the 8th and 9th nerves, though to a less extent. A comparison with Fig. 53, showing the posterior root-entry zone in the 7th cervical segment, reveals the similarity of the process. The whole extra-medullary nerve root seems carried into the pons with the fibres retaining their neurilemma sheath and nucleus. Different strands showed this to a varying extent of their course, and individual fibres, with the structure of the peripheral nerve, became directly continuous with the normal non-nucleated and sheathless medullated fibres, the nuclei in the tube becoming more and more isolated and the transition occurring almost imperceptibly.

This nucleation of the fibres could be traced far into the pons, and even the deep strands of the 5th nerve showed that one-third or one-half, or even more, of the fibres composing them were nucleated. In these deep sensory strands the neurilemma sheath was absent, and the nuclei were more definitely within the fibre contour than in the more superficial fibres. If such strands were cut transversely we get the appearance shown in Fig. 58, and, if cut longitudinally, that in Fig. 57. This seems to us to be the meaning of many of the nucleated patches. An explanation would thus also be found for the fact that such transversely cut fibres could often be followed for a considerable distance in successive sections with only a slightly varying position, and with no very defined relation to any vessels, while the longitudinally cut fibres soon become oblique. In all of these patches the normal framework of the tissues was preserved, with an enlargement of the glia cells in relation to the fibres: a change similar to that noted in relation to the nucleated patches internal to the posterior root-entry zone in the cord. Here, also, as in the cord, the nucleated fibres could never be, beyond doubt, found to end loosely in the tissue or break up into fusiform elements. Weigert preparations proved a degeneration of the fibres coincident with the nucleation, but adjoin-

ing Bielschowsky preparations proved the integrity of the axis-cylinders.

Before leaving these changes in relation to sensory nerve paths, which we consider quite analogous to the changes in the posterior root-entry zone, it is necessary to add that a very exhaustive examination of serial sections of medulla and pons was made before the conclusion was arrived at that this change was limited to sensory strands. The only motor nerve root which showed changes at all comparable was the third. The fibres of the oculo-motor nerve seemed to have a very extensive zone of exit—passing out from the surface in several widely separated strands, the outermost of which adjoined the crus. Several of these strands were nucleated, but only for a short distance, and the greater part of the change was analogous to that, to be described under (5), in connection with the motor nerve roots.

### (3) PATCHES COMPOSED OF INTERLACING NUCLEATED FIBRES AND FUSIFORM NUCLEATED ELEMENTS.

The first impression received from a low power view of such a patch, if the attention be confined to the loose meshwork, is that we have a proliferation of young connective-tissue cells, for this loose tissue is in intimate relation to dilated capillaries, which, with their walls composed of a single layer of endothelium, are very similar to new-formed vessels (59 and 61). A closer examination, however, shows that these cells differ in many respects from young fibroblasts, and that they bear a close resemblance to the spindle-shaped elements, derived from the proliferation of the sarcolemma nuclei and the increase of the sarcoplasm—young myoblasts—in the young granulation tissue between the two ends of a muscle wound, before the increasing condensation of the scar tissue has caused their atrophy and their transformation into connective-tissue-like elements. Such cells stain more homogeneously than fibroblasts, have not the same branching processes, and can for a time be readily distinguished from connective-tissue cells and endothelial cells.

Further, it is noted that these spindle-shaped nucleated elements link themselves on to one another in the most definite way (Figs. 59 and 60), again just as endothelial cells in granulation tissue align themselves to form young capillaries. There is this difference, however, that this alignment is seldom in two parallel rows with a lumen between, but is an interlacing in very varied directions of linked elements, which only later converge, as it were, into strands composed of several nucleated cell-chains. From Figs. 59 and 60 it can be seen that as these fusiform nucleated elements link themselves to one another, end to end, their processes fuse in an imbricated manner, and that by the time the cell-chain thus formed is extricating itself, as it were, from the maze of cells and passing out from them, it has assumed an uneven cylindrical appearance, the points of fusion being still narrower in calibre than the parts of the cylinder which contain

the nuclei. Such nucleated, protoplasmic cylinders are, in future, indicated when the term "nucleated tube" is used.

Several of these chains of linked cells give the appearance of a dichotomous division (Figs. 59 and 60). This forking in some instances clearly reveals the mode of origin of the two first components of the branches, for the first links in the respective new chains lie very close and almost parallel to one another. The impression is received that a longitudinal cleavage of a terminal cell had occurred, that the proximal portions of each resultant cell had remained attached to the common stem, and that growth in length had continued in each new branch till, further on, a new longitudinal cleavage had taken place when a new dichotomous division resulted. No mitosis could anywhere be noted.

The convergence of the nucleated tubes forms bundles which run as parallel strands for a varying distance (Fig. 62), and then assume a more convoluted course. Such convoluted nucleated tubes (Fig. 63) form the transition to the definite nodules to be described below (4).

Between the parallel strands formed by the convergence of the cell-chains are found cells and tubes cut transversely, which show clearly their identity with the longitudinal elements.

*Structure of the fusiform cells and nucleated tubes.*—The earliest stage of the cell is a very thin spindle, with an elongated nucleus and a slight amount of protoplasm extending from its poles. As the cell increases in size the protoplasm extends, and with Van Gieson's stain is homogeneous and faintly tinged pink. Larger cells, under oil immersion, reveal the presence of a more deeply staining filament in the protoplasm just on one side of the cell; this filament extends, with the growth of the cell, beyond the poles of the nucleus and becomes more evident. In cells which show a central nucleus, their filament can often be recognised through it and extending on either side for a short distance. The nucleus stains always deeply, but shows a chromatin network and membrane and fine nodal points, one or two of which are always larger than the others. The transverse section of such fusiform cells shows the nucleus at first occupying almost the whole disc; later it leaves a portion of protoplasm on one side, in which is again recognised the deeply-staining point (Fig. 1).

As the cells become linked to form chains, the central filament becomes more evident in each cell element, and as the fusion of the imbricating processes becomes complete and the cell borders disappear, the discontinuous filaments form a continuous line which may be traced passing two, or three, and even more nuclei. The surrounding protoplasm in these tubes is homogeneous, yellow tinged with faint pink, and its outer border is often denser and deeper pink. The nucleus tends to be peripheral, but is still large, and surface views especially give the impression of its being still central or bulging into the lumen. The examination of cross-sections gives the true relation of the nucleus to the protoplasmic tube (Fig. 2).

A further stage in the evolution of these nucleated tubes, which have resulted definitely from the fusion of the fusiform cells, is reached

as the contours become cylindrical and parallel, and most of the nuclei have taken a peripheral position and flattened appearance. The protoplasm still stains homogeneously, but the condensed outer border and the sinuously-winding filament become more marked (Fig. 3).

In the loose meshwork there is present only a slight amount of intercellular tissue derived from the adventitia of the neighbouring blood vessels: between the tubes, however, distinct glia fibrils, very evident with iron-haematoxylin, run parallel to them. Very enlarged glia cells, with thick branching processes, are found in close relation to the meshwork.

Preparations, stained with polychrome methylene-blue, reveal the presence in numerous cells of very fine granules, accumulated chiefly at the poles: similar granules are found here and there in the protoplasm around the nuclei of the tubes. The metachromatic staining of these granules indicates their relation to the granules described by Reich and Alzheimer.

Preparations, stained with iron-haematoxylin-fuchsin, show that these nucleated tubes or bands are in various stages of commencing myelination (Figs. 14 and 66): some tubes show only the pink tinge of the fuchsin (Fig. 14*a*), but all indicate the segmental character of the tube in which this differentiation is taking place. The first evidence of this is noted in a darkening just within the outer border of the segment (Fig. 14*b*); this then shows a fine granularity (Fig. 14*c*) and, later, a commencing lattice-work appearance (Fig. 14*d*): on cross-section of such tubes, this transition from a homogeneous, dark ring or shadow, through the granular stage, to the appearance of dark radial peripheral points is also seen, and also the relation of the nucleus to the forming myelin (Fig. 14*f*).

These appearances are undoubtedly those of a commencing myelination of these tubes, formed by the alignment and fusion of the fusiform elements. In one strand may be recognised tubes which show varying stages in its development (Fig. 66). Several writers have pointed out that in its first development in the peripheral nerve the myelin is deposited in imbricated, closely applied rings, the spaces between the rings representing the future Lantermann incisures. On cross-section such fibres would show radial points of myelin at the periphery, and, on longitudinal section, the myelin would take the form of a lattice with elongated spaces.

The appearance of the nucleated tube at this stage, in Van Gieson preparations, is not indicative of the structure of a peripheral nerve: the nuclei are much larger and more numerous, and the neurilemma sheath is absent. In the stage to be next described, where the tubes assume a convoluted disposition, they become more like the peripheral nerve fibre in character.

We desire to draw special attention to the photographs (Figs. 59-66) which show beautifully the fusiform nucleated elements (Figs. 59 and 60), their linking into cell-chains and the fusion of imbricated ends (Figs. 60 and 65), the transition of the chains into nucleated bands (Fig. 61), and the convergence of the bands into longitudinal

strands (Figs. 62 and 66), between which are found tubes cut transversely.

#### (4) NODULE FORMATION WITH CONVOLUTED ARRANGEMENT OF THE FIBRES.

Such nodules were found in very few and isolated positions. The largest, composed of tortuous fibres with numerous nuclei, is represented in Fig. 64, and was situated laterally and posteriorly to the strands of the 7th nerve and close to the floor of the 4th ventricle. It had developed in relation to one side of a medium-sized vessel, and when traced upwards divided into strands which passed along the two divisions of this vessel to form more or less large nodules in relation to each branch. In serial sections both the original nodule and the two smaller ones could be followed till the fibres unwound themselves from their compact disposition both at the upper and lower limits into tortuous but parallel fibres, which resolve into nucleated tubes, and then finally break up into interlacing fusiform nucleated elements. Within the fibres of the nodule, in iron-haematoxylin-fuchsin sections there is present a distinct central filament—the axis-cylinder, a continuous but faintly-staining myelin sheath, and, where the fibres can be isolated, a distinct outer membrane staining pink. A small amount of interfibrillar connective tissue is also present, derived probably from the adventitia of the vessel. Fig. 5 shows the fibres of this nodule cut longitudinally for a short part of their course, with a structure very similar to that of a peripheral nerve: the nuclei, however, are larger and more numerous.

If a dissociation of the fibres by an increase of the interfibrillar tissue takes place, as was found in a nodule lying near one inferior olivary nucleus, the fibres assume more the appearance of those of a peripheral nerve. In such fibres the fact that the nucleus—though peripheral—is still definitely within the lumen of the tube and is not applied to it from the outside as a connective-tissue nucleus, can be very beautifully recognised. In relation to all the nodules, similar in structure to that just described, there were found, in the immediately surrounding tissue, radiating lines, the structure of which was resolved into cell-chains and isolated fusiform cells which were undergoing a fibrous transformation.

#### (5) AREAS IN RELATION TO THE SUPERFICIAL ORIGIN OF MOTOR CRANIAL NERVES.

The earliest indication of such change was in the form of a proliferation of cells just within the pia, accompanied by a certain amount of fibrosis and degeneration of emerging fibres. This change was most marked in the emerging roots of the hypoglossal on both sides. These strands, with Weigert's stain, show along their course a degeneration which must be compared and related to the degeneration of the intra-

medullary anterior nerve bundles in the cord. In addition to this, however, there was a definite proliferation of cells, many of which are spindle-shaped elements, which again fuse to form nucleated tubes, closely applied to one another and intertwining. Further, the fibrosis extended to involve these new-formed elements. Such a picture required very careful examination under oil immersion and the use of several staining methods to interpret its constituent elements. Weigert and Bielschowsky preparations showed a disappearance of the myelin and a diffuse staining of the axis-cylinder of the emerging fibres, while control preparations, stained with Van Gieson's method, proved that there is a dense network of new nucleated tubes and fusiform cells, and an advancing fibrosis which is causing their atrophy and disappearance. The appearance of some of these nucleated tubes is very similar to that which we have seen in stump-neuromata, where the increasing condensation of the scar-tissue causes compression of many of the new nerve tubes—the myelin of which does not yet take the specific myelin stain and shows as a homogeneous yellow zone with central axis-cylinder. Radiating from such areas may be found the nucleated tubes and spindle-shaped elements undergoing a fibrous transformation.

#### (6) PATCHES OF PURE FIBROSIS.

This again must be brought into relation to a similar change in the spinal cord. It has already been stated that small areas may be recognised which, under low power, stain diffusely pink, and, under high power, reveal few or no structural elements. These areas are related to a thickened vessel, and in the extension of the fibrosis the new-formed nucleated tubes are involved. Within those areas, showing no recognisable cell elements with other stains, there may frequently be found in Bielschowsky preparations diffusely stained axis-cylinders which we have taken to represent the remains of axis-cylinders of the fibres displaced by the new-formed nucleated tubes.

It is thus seen that the histological picture is an extremely complex and varied one, that at first sight the recognition of any relation between the different appearances is difficult, and that a prolonged investigation of serial sections and comparison of adjoining differently stained sections is necessary before any satisfactory conclusion as to the nature of these nucleated patches and nodules and their relation to one another can be reached.

We look upon the patches showing a meshwork of interlacing fusiform cells, described in (3), as the first stage in a process which in the medulla and pons evolves as far as the nodule formations described in (4). Cells, the genesis of which cannot be traced, have proliferated, and the proliferated cells link on to one another and form chains of cells which converge to form parallel strands. The simpler strands, owing to the retained glia framework, may for a time conform to the plan of the normal strands of the part involved, but, in their further evolution, they became tortuous and intertwined and convoluted, and form the

nodules described in (4). The simplest patches described in (1) (a) we regard as sections of the margins of a patch of nucleated strands similar to those in (3). The nodules described in (5), in relation to the superficial origin of the motor nerves, we also take to owe their origin to the proliferation of spindle-shaped cells, which form nucleated tubes and nodules. The nodules have then undergone a fibrosis, which involves the emerging roots. The small areas of fibrosis in (6) are areas of a fibrous transformation affecting blood vessels, nucleated tubes, and spindle-shaped cells.

Finally, the nucleated patches described in (1) (b), cut transversely and longitudinally, we relate to transverse and longitudinal strands of sensory nerves in their path to their nuclei of origin. An explanation of the areas described in (2) in relation to the sensory nerves is extremely difficult. A comparison of their extra-medullary and intra-medullary course shows that within the brain the interstitial tissue and nucleation is more evident, and the impression is confirmed that here also not only had the neurilemma sheath been carried inwards, but pial fibrous tissue also, and that within the brain this connective-tissue element in relation to the fibres had increased. The change must be related to, and have the same explanation as, the fibrosis affecting the posterior roots of the cord; but further than this it is impossible to go.

To complete this histological study it is necessary to refer briefly to the presence of several abnormalities which can here be grouped together.

At the level of the point of emergence of the 7th nerve, a curious condition is to be found, possibly of the nature of a malformation. The tissue immediately to the mesial side of the facial nerve appears to be unusually vascular, and a cavity—small in size and with irregular walls—is developed in relation to the vessels. This cavity increases in size as it is traced upwards, and involves the fibres of the trapezium. Higher still, it opens out directly on to the surface of the pons and a large irregularly shaped depression results, which does not involve either the facial nucleus or the descending root of the 5th nerve, but does destroy part of the transverse fibres of the pons and trapezium (Figs. F, G, H, I).

Round the vessels, especially the smaller vessels, of the tissue in close relation to this malformation, a granular deposit was found: the dust-like particles were arranged usually in a row in the adventitial spaces and frequently fused to assume irregularly rounded forms. If these further coalesced, they formed wide layers in the hyaline adventitia of the vessel. These concretions



stained with the hæmatoxylin very like calcareous particles, and with polychrome methylene-blue were a diffuse green (Fig. 55).

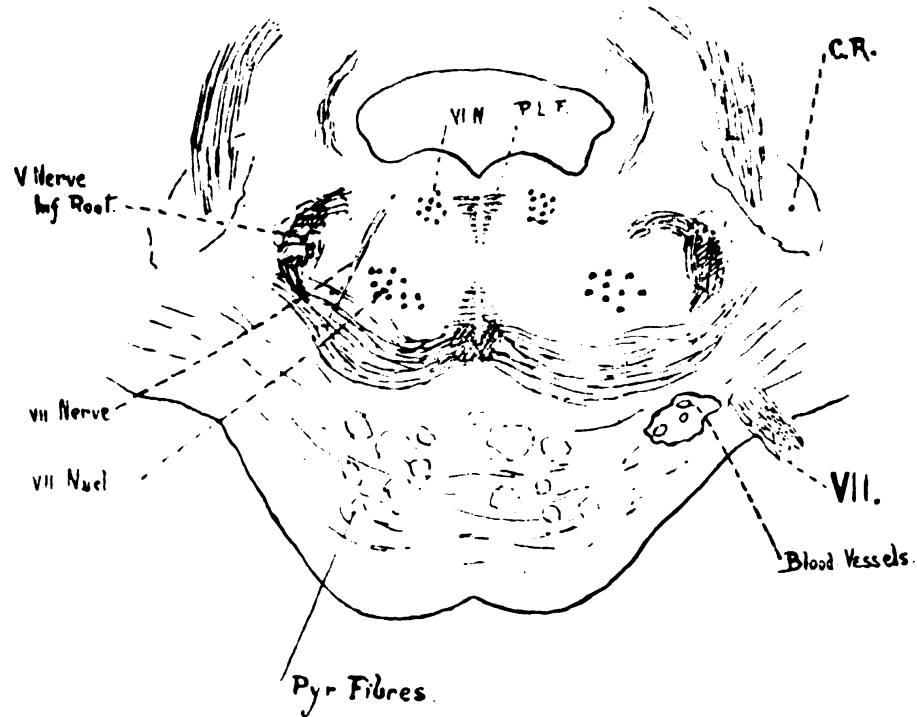


FIG. F.

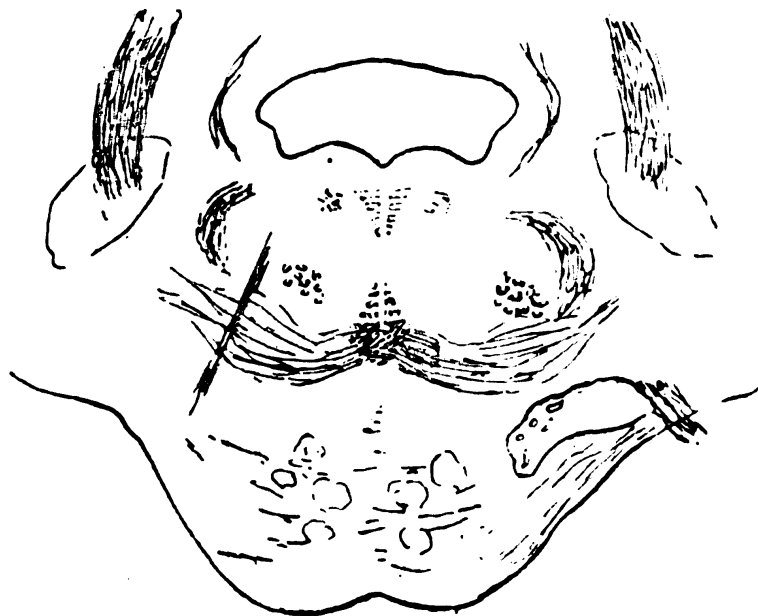


FIG. G.

In the lumbar cord, the pia structure was interrupted at one or two levels and replaced by small nodules, staining homogeneously yellow with Van Gieson's method in contrast to the pink

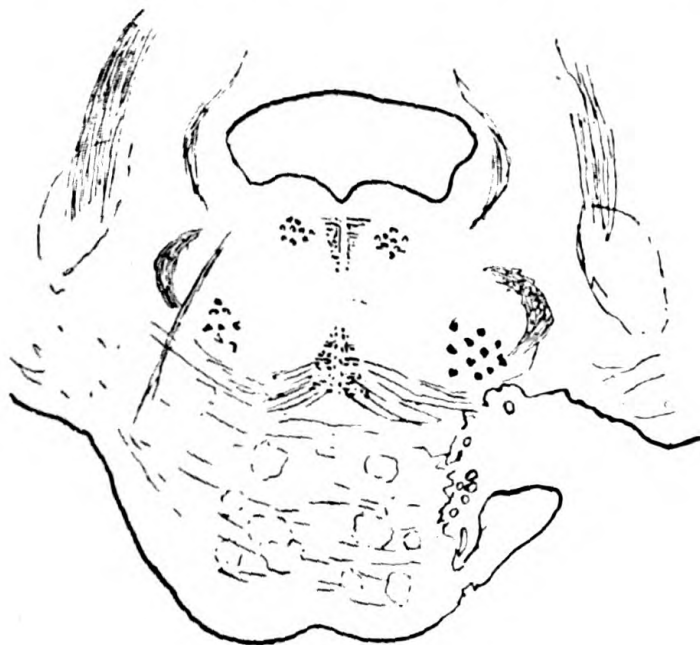


FIG. H.



FIG. I.

connective tissue of the pia. These nodules were immediately anterior to the posterior roots, and the staining gave the impression of glia islets which had undergone a homogeneous transformation.

Finally, in a very few sections, well-stained and well-developed ganglion cells—of the type of those in the spinal ganglia—were found amongst the extra-medullary anterior roots immediately outside the pia.

(*To be continued.*)

### DESCRIPTION OF PLATES.

(*Figs. 1-14 are from drawings: Figs. 15-66 are micro-photographs.*)

#### PLATE I.

*Figs. 1-5.* Stages in the evolution of the nucleated nerve fibre from individualised fusiform cells. *Cf.* Figs. 59-66. Van Gieson's stain.  $\times 1,000$ .

Fig. 1. Earliest stage—a thin spindle with elongated nucleus and a slight amount of protoplasm: gradual increase in the size of the cell with a more deeply staining filament in the protoplasm on one side of the nucleus. Transverse sections of such cells show at first the nucleus occupying almost the whole of the disc.

Fig. 2. Uneven cylindrical appearance of the nucleated "tube": the cell processes have joined in an imbricated manner and fused, and, with the fusion, the cell outlines have become lost. The discontinuous filament in each cell may now be traced as a continuous line. Cross-sections of such cylinders through nucleated and non-nucleated portions.

Fig. 3. Contours of nucleated "tubes" have now become parallel, the sinuously winding filament more marked, and the nucleus has become slightly peripheral and flattened, though still large and bulging into the "lumen" of the "tube." Cross-sections of such "tubes."

Figs. 4 and 5. Nucleated "tube" gradually assuming the characters of the fibres of a peripheral nerve with central filament very distinct, nucleus flattened and peripheral, condensed outer layer of myelin, and the appearance of a slight amount of interfibrillar tissue.

#### PLATE II.

Fig. 6. Isolated neuroma nodule, within the adventitia of a medium-sized vessel, lying in the anterior column of white matter (1st dorsal segment). The nodule is composed of interlacing fibres with neurilemma nuclei and the fibres are cut transversely, obliquely, and longitudinally. Note the central vessel and the outer thickened wall of the adventitia completely cutting off the nodule from the surrounding healthy white matter. *Cf.* Fig. 19. Van Gieson's stain.  $\times 250$ .

Fig. 7. Glia cell proliferation and hyperplasia in an area of commencing fibrosis in the cord. Note infiltration of lymphocyte-like cells, also the presence of spindle-shaped elements. Van Gieson's stain.  $\times 350$ .

#### PLATE III.

*Figs. 8-12.* Cajal's reduced silver method for myelinated axis cylinders.  $\times 250$ .

Fig. 8. Neuroma nodule. Whorl-arrangement of the fibres giving the typical ball-of-wool appearance; some of the fibres interlacing in all directions and others passing parallel for a time.

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- Fig. 9.** Transverse section of normal small vessel in the white matter of the cord from neuroma case.
- Fig. 10.** Similar vessel with delicate fibres in the adventitia.
- Figs. 11 and 12.** Vessels in the grey matter of the 7th and 8th cervical segments showing within the adventitia a plexus of fine fibres, with branchings ending in homogeneous bulbs.

### PLATE IV.

- Fig. 13.** Anterior spinal root vessel within the pia (lumbar cord); showing very numerous newly formed medullated fibres within the adventitia. Note the vesicular appearance and intertwining of the new fibres, that the internodal segments are short and irregular, the fibres being made up of elongated, often bulging, cylinders with narrow connecting bridges, and that the myelin stains specifically yet not so intensively as that of fully formed fibres. Kulschitzky-Pal and picro-fuchsin.  $\times 350$ .
- Fig. 14.** *Cf.* Figs. 65, 66. Stages in the myelination of the nucleated "tube." Note the segmental character of the tube in which the differentiation is taking place (*a*), the darkening (*b*), and the granularity (*c*) within the outer border of each segment; and the commencing lattice-work appearance given by the newly formed myelin (*d*, *e*). Cross-sections of fibres in the above stages (*f*). Heidenhain's iron-haematoxylin stain.  $\times 700$ .

### PLATES V., VI.

- Figs. 15-18.** Transverse sections at different levels of the lumbo-sacral cord. Note (1) numerous nodules both in the grey and white matter, (2) the unravelling of the fibres composing the nodules into the general texture of the tissue, (3) the radiating lines of fibrosis passing inwards along pial septa and lateral vessels, also (4) the marked fibrosis of the posterior root-entry zones. Paraffin sections. Van Gieson's stain. Figs. 15 and 16,  $\times 20$ . Figs. 17 and 18,  $\times 10$ .

### PLATE VI.

- Figs. 19-22.** Different varieties of nodules to show the intertwining of the fibres and the varying amount of neurilemma nuclei. Van Gieson's stain.
- Fig. 19.** Isolated nodule in the white matter of the anterior column of the 1st dorsal segment. *Cf.* Fig. 6.  $\times 180$ .
- Fig. 20.** High-power view of the nodule in Fig. 15 seen passing inwards from the pia in region of ligamentum denticulatum.  $\times 200$ .

### PLATE VII.

- Figs. 23-28.** Kulschitzky-Pal modification of Weigert's medullated sheath stain. Different levels of the lumbo-sacral cord: to show the medullated character of the fibres composing the nodules.
- Fig. 23.** Large nodule, with very fine intertwining fibres, at anterior mesial angle of grey matter.  $\times 15$ .
- Fig. 24.** Similar nodule, with slightly coarser fibres, within the mesial margin of anterior grey matter.  $\times 20$ .
- Fig. 25.** Nodule within a glial septum, together with a vessel in the pia showing numerous fibres within the adventitia. *Cf.* Fig. 13. In successive serial sections a connection could be traced between the fibres in the vessel-wall and the fibres composing the nodule.  $\times 35$ .
- Fig. 26 ( $\times 100$ ), Fig. 27 ( $\times 160$ ), and Fig. 28 ( $\times 160$ )** show high-power views of the nodules in Figs. 23, 24, and 25 respectively.

### PLATE VIII.

- Figs. 29-34.** Cajal's reduced silver method for axis-cylinders. Different levels of lower cervical cord: to show the presence of axis-cylinders in the fibres composing the nodules.

- Fig. 29. The nodule drawn in Fig. 8. This nodule had its long axis parallel to the long axis of the cord.  $\times 200$ .
- Fig. 30. Nodule, of more cylindrical shape, with its long axis at right angles to the long axis of the cord. Note the very fine character and intricate intertwining of the fibres composing the nodule.  $\times 160$ .
- Fig. 31. Nerve fibres in the adventitial lymph spaces of the vessels at the base of the anterior median fissure and of the commissural vessels. These fibres in successive sections were traced to the nodule in Fig. 29.  $\times 75$ .
- Fig. 32. Vessels passing to the anterior horn showing numerous fine fibres in the adventitia.  $\times 200$ .
- Fig. 33. Similar vessel within the grey matter showing the fibres in the adventitia following the bending and the division of the vessel.  $\times 160$ .
- Fig. 34. Intra-medullary course of the anterior root artery showing very fine fibres in the adventitia.  $\times 250$ .

## PLATE IX.

- Figs. 35-39.* Sections chosen from 3rd lumbar segment (cut serially) to trace the mode of formation of the nodules. Kulschitzky-Pal and picro-fuchsin.
- Fig. 35. Wedge-shaped nodule lying in the pia, opposite the ligamentum denticulatum, and extending inwards from the periphery.  $\times 70$ .
- Fig. 36. Shows the fibres passing from this nodule in the adventitia of the lateral vessel to a nodule at the margin of the grey and white matter.  $\times 50$ .
- Fig. 37. Nodule of Fig. 36 showing the unravelling of the fibres into the general texture of the grey matter.  $\times 180$ .
- Fig. 38. Fibres of nodule in Fig. 35 passing inwards from the periphery, forming tuft-like nodule, and fibres in a vessel-wall in the pia.  $\times 180$ .
- Fig. 39. Fibres passing from nodule of Fig. 35 in parallel strands towards the region of anterior roots.  $\times 35$ .
- Fig. 40. Wedge-shaped nodule, at interior mesial angle of anterior column, formed by fibres which have passed mesially from the anterior roots. Kulschitzky-Pal and picro-fuchsin.  $\times 20$ .

## PLATE X.

- Figs. 41-43.* Sections from 2nd sacral segment. Kulschitzky-Pal and picro-fuchsin.
- Fig. 41. Fibres passing in commissural vessel to anterior horn.  $\times 50$ .
- Fig. 42. Very fine fibres, contorted irregularly, in the adventitial lymph spaces of the anterior central vessels at base of anterior fissure. Vessel dividing: one branch seen in Fig. 41, another in Fig. 43.  $\times 50$ .
- Fig. 43. Branch of the anterior central vessel seen in Fig. 42, passing to lateral grey matter with leashes of fine fibrils in its adventitia.  $\times 50$ .
- Figs. 44-46.* Paraffin sections from 3rd sacral segment, Van Gieson's stain, showing nodule in region of central canal (Fig. 44,  $\times 160$ ), and in successive serial sections the unravelling of the nodule into nucleated fibres (Fig. 45,  $\times 160$ ), and a meshwork of individualised nucleated elements (Fig. 46,  $\times 160$ ).

## PLATE XI.

- Fig. 47. Posterior root-entry zone (3rd lumbar segment), to show the *Ablassung-zone*, or constriction zone, or ring of Obersteiner. Kulschitzky-Pal.  $\times 50$ .
- Fig. 48. Anterior root-emergent zone (7th cervical segment), to show similar *Ablassungzone* in relation to the anterior roots. Kulschitzky-Pal.  $\times 70$ .
- Fig. 49. Glia cell proliferation and hyperplasia. Cf. Fig. 7. Van Gieson's stain.  $\times 180$ .

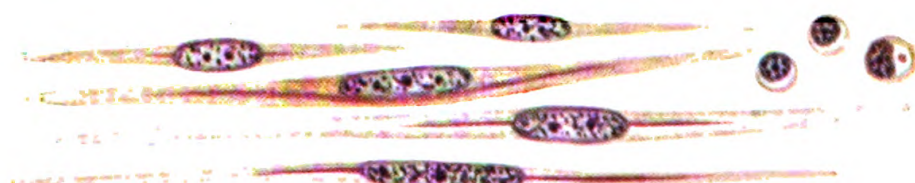


FIG.  
1.

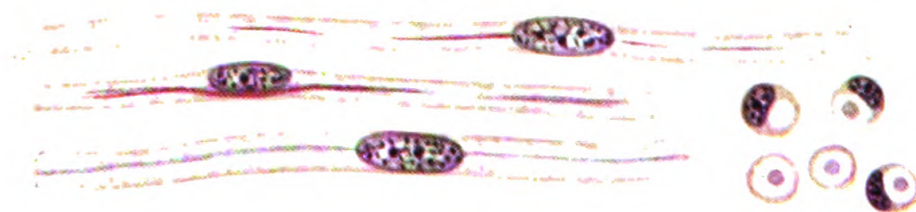


FIG.  
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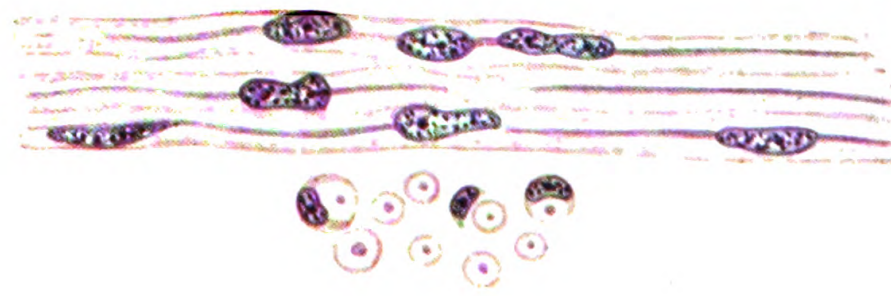


FIG.  
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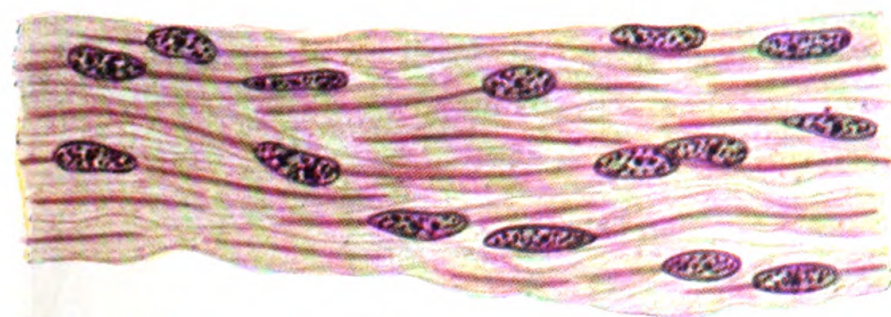


FIG.  
4.

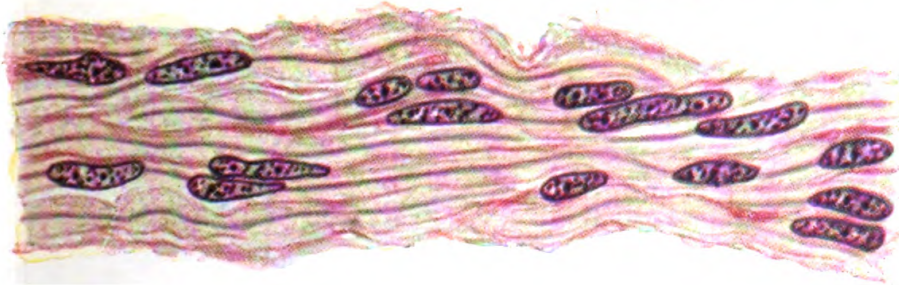


FIG.  
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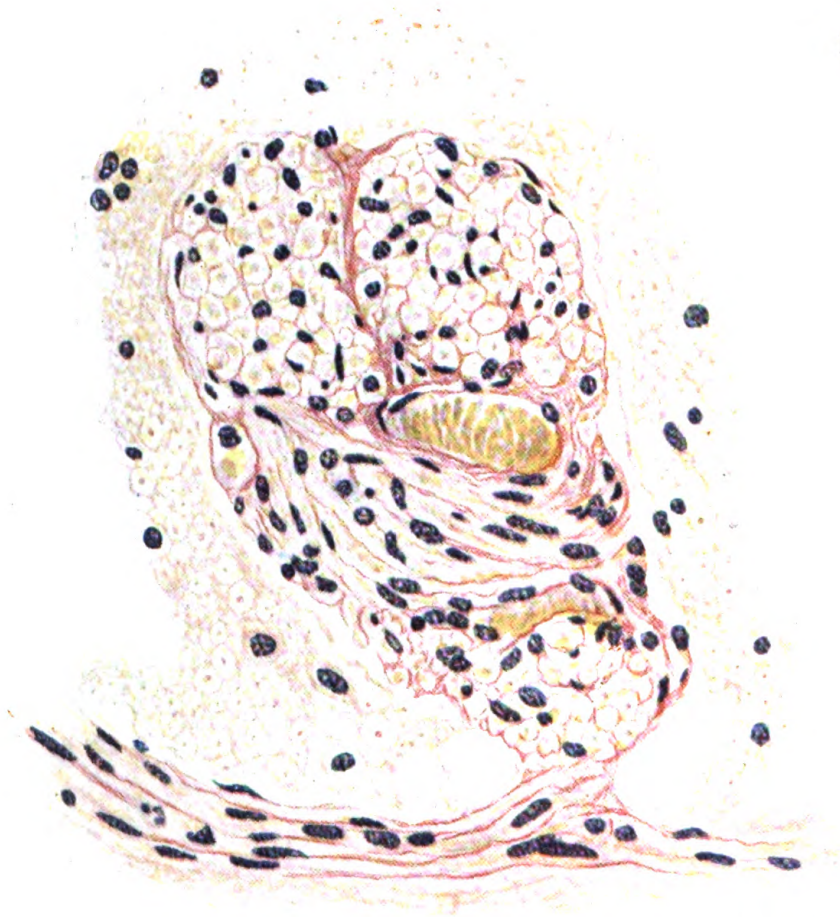


FIG. 6.

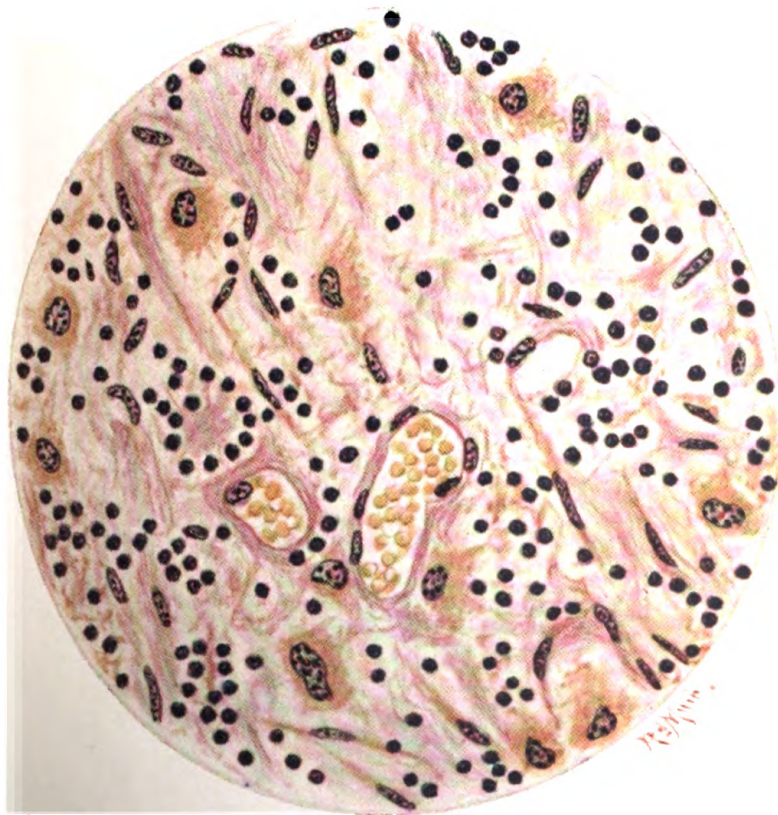


FIG. 7.







FIG. 8.

FIG. 9.

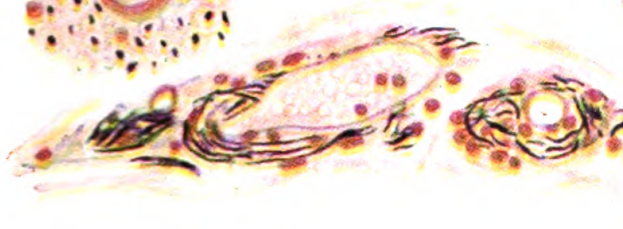
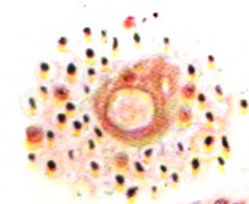


FIG. 10.



FIG. 11.



FIG. 12.



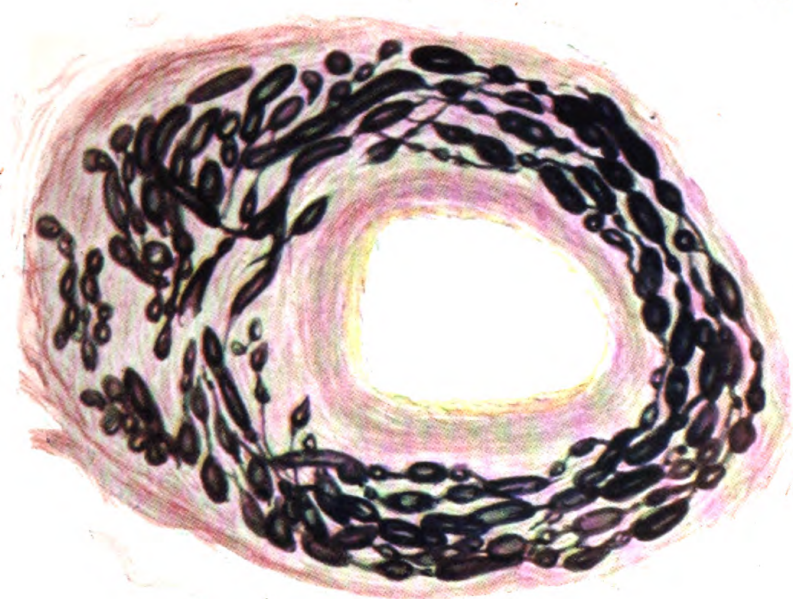


FIG. 13.

*R. M. 100.*

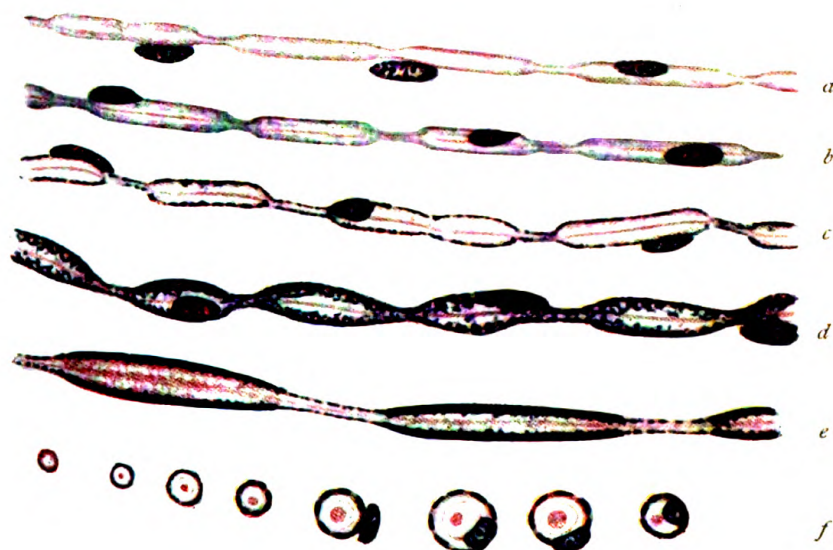


FIG. 14.

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PLATE 5.



FIG. 15.







FIG. 17.

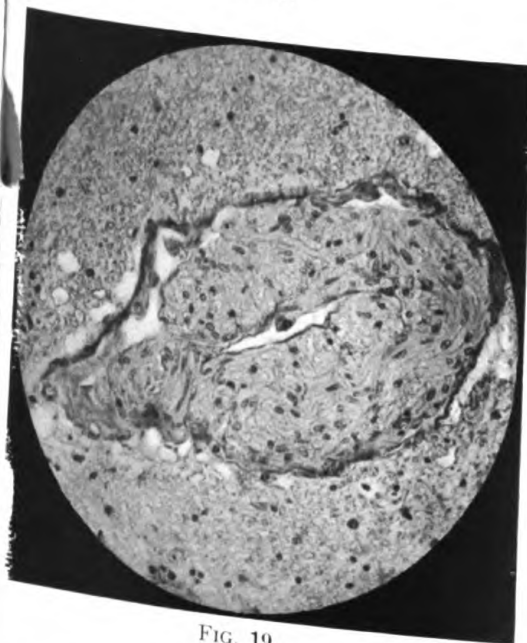
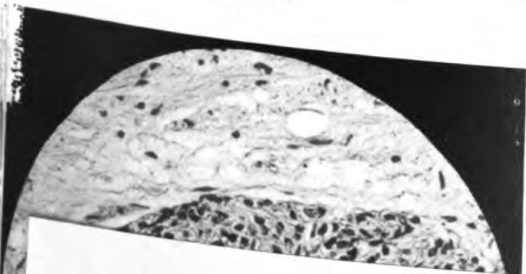


FIG. 19.





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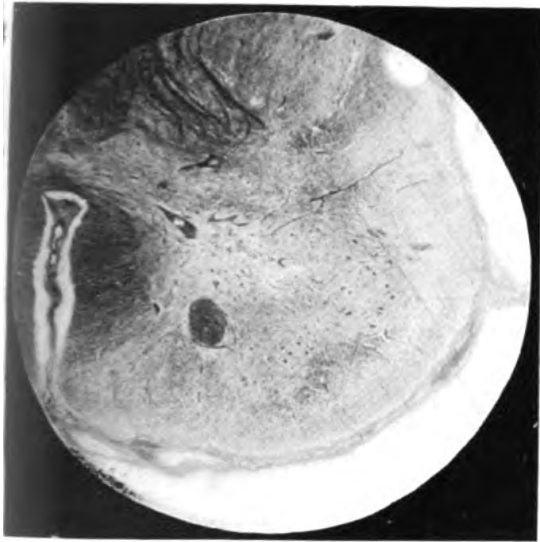


FIG. 23.

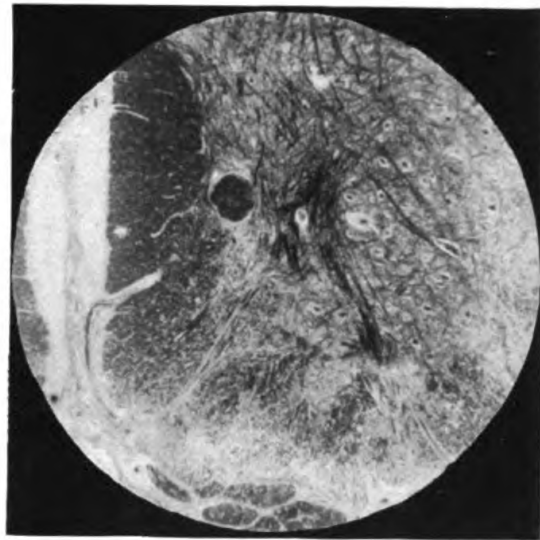


FIG. 24.

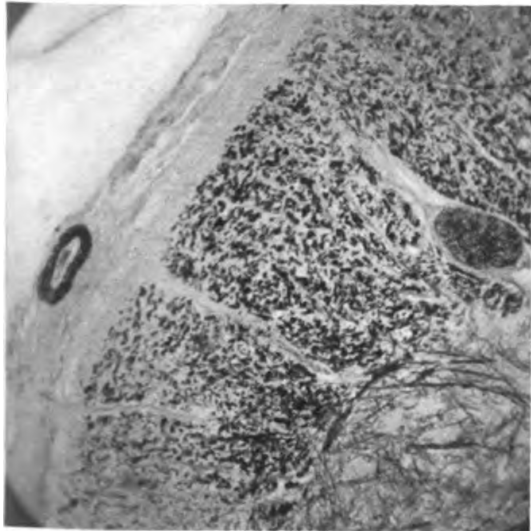


FIG. 25.

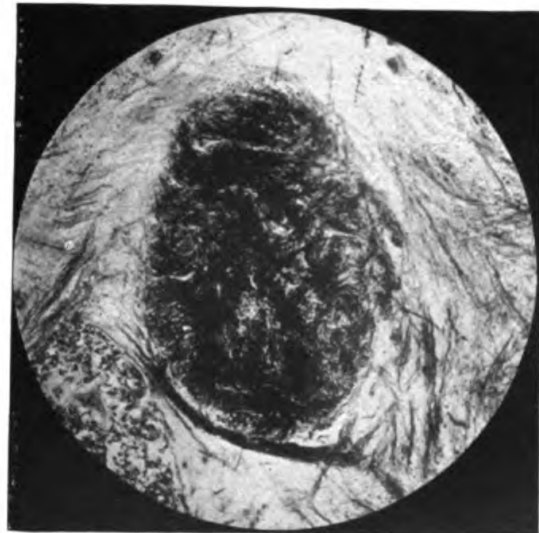


FIG. 26.

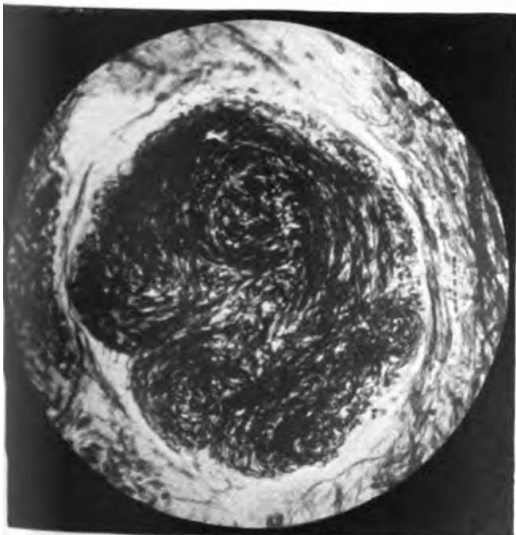


FIG. 27.

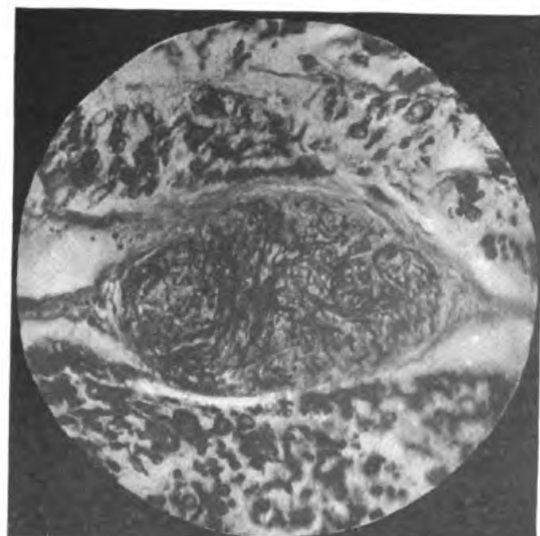


FIG. 28.

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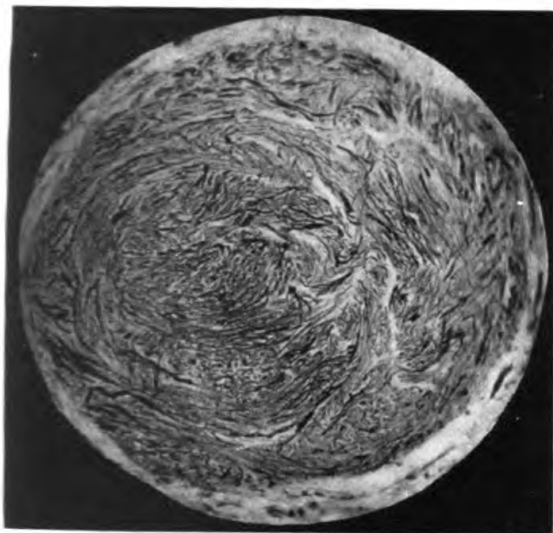


FIG. 29.

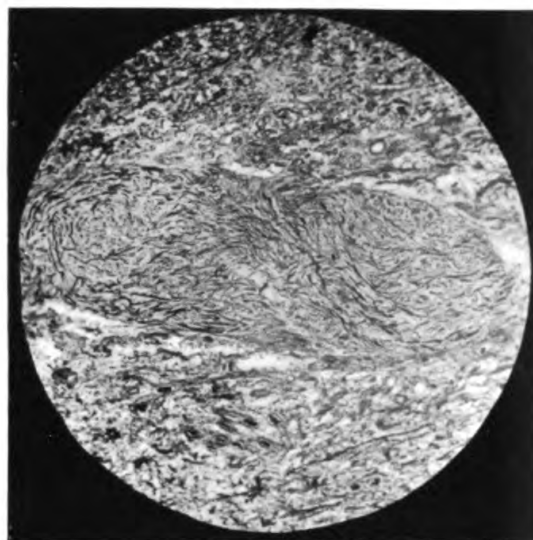


FIG. 30.

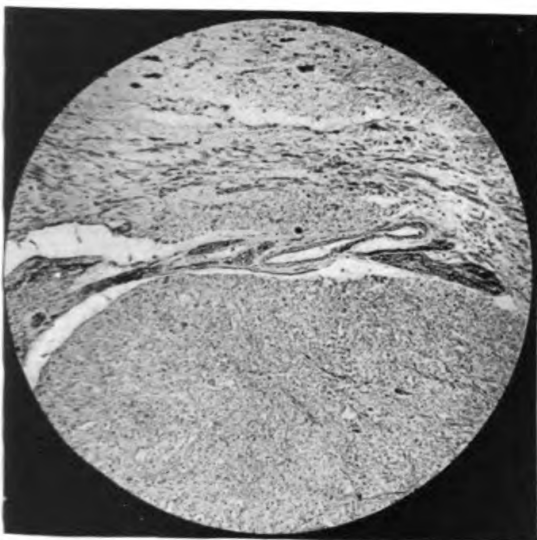


FIG. 31.



FIG. 32.



FIG. 33.

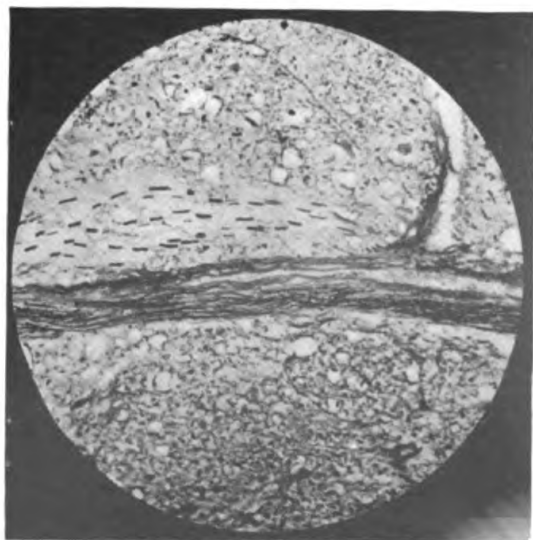


FIG. 34.



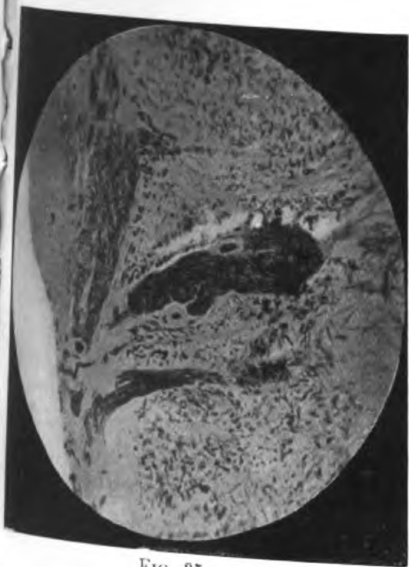


FIG. 35.

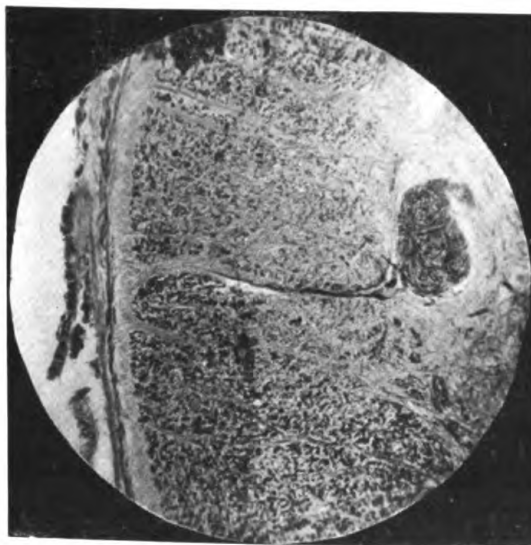


FIG. 36.



FIG. 37.

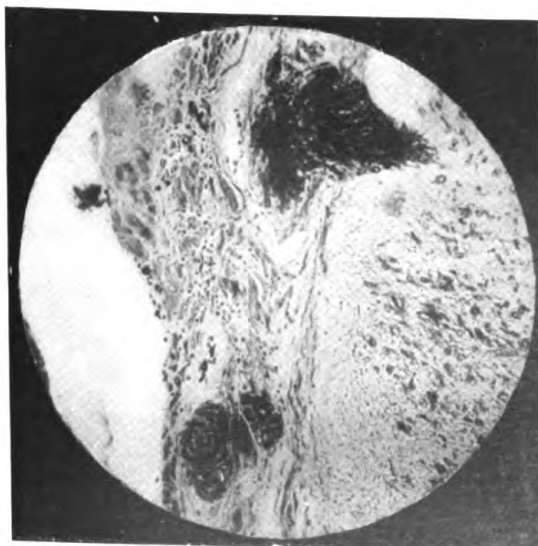


FIG. 38.

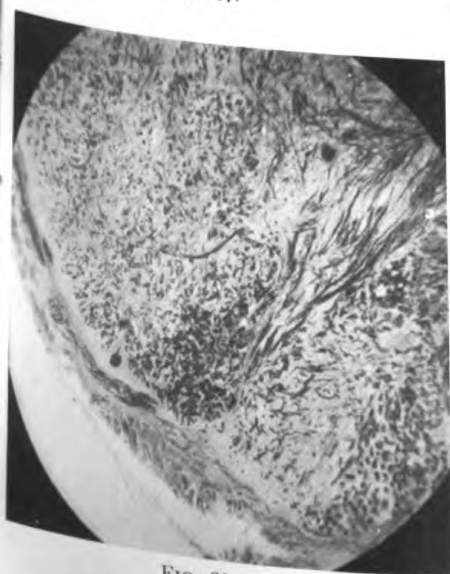


FIG. 39.

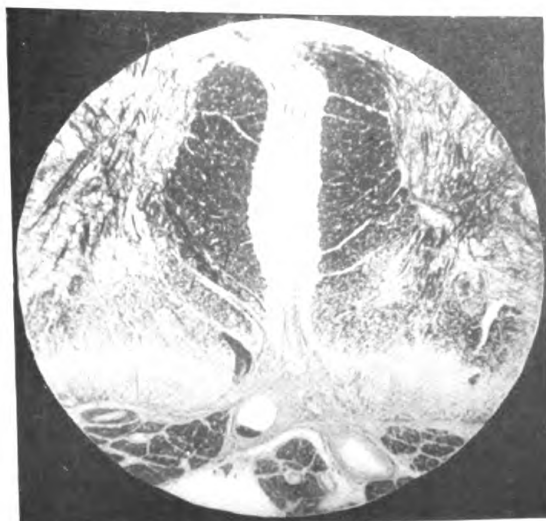


FIG. 40.



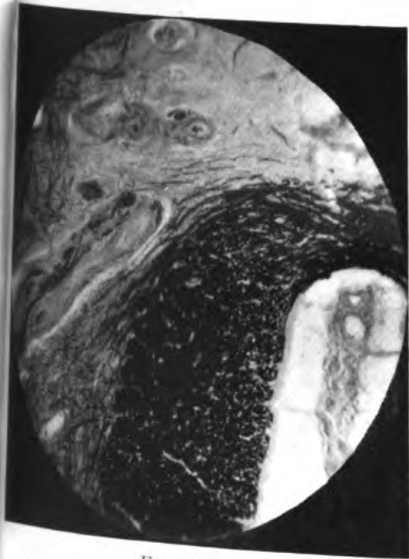


FIG. 41.



FIG. 42.

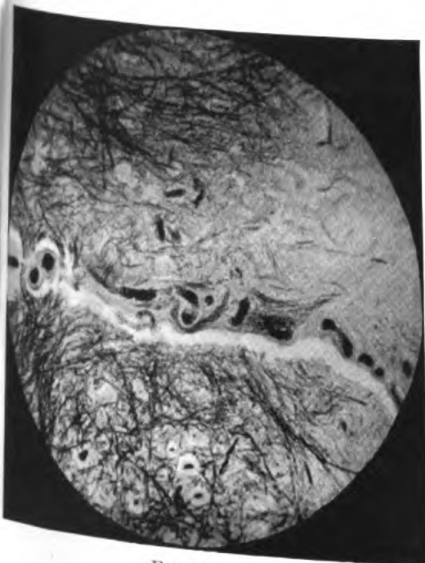


FIG. 43.

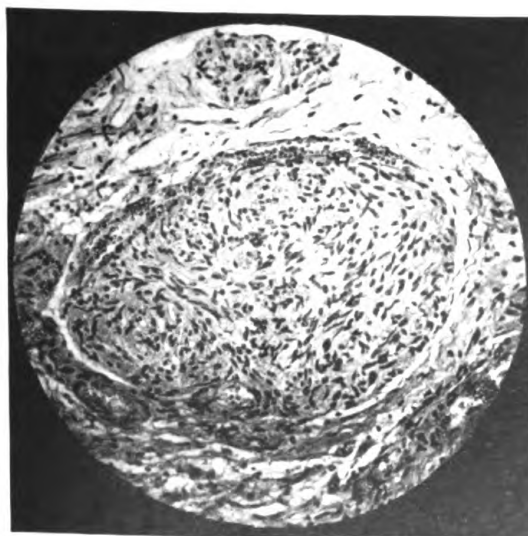


FIG. 44.

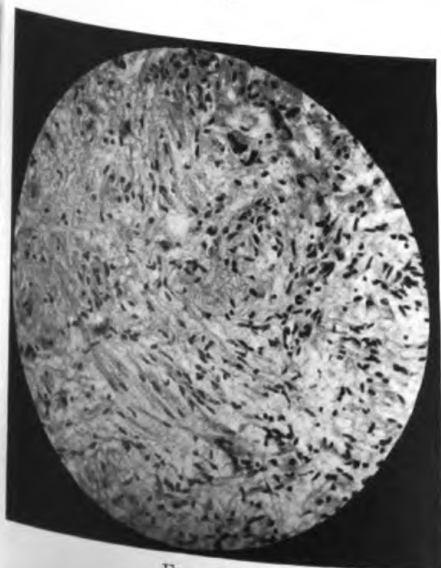


FIG. 45.

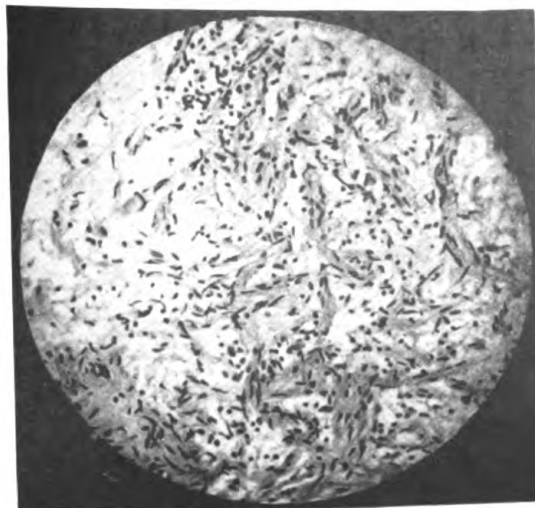


FIG. 46.





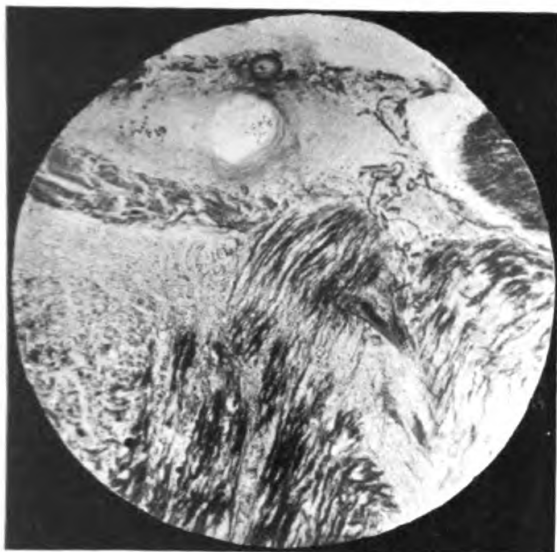


FIG. 47.

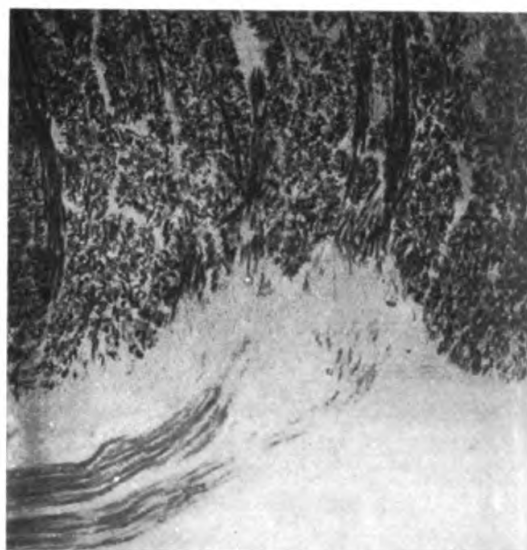


FIG. 48.

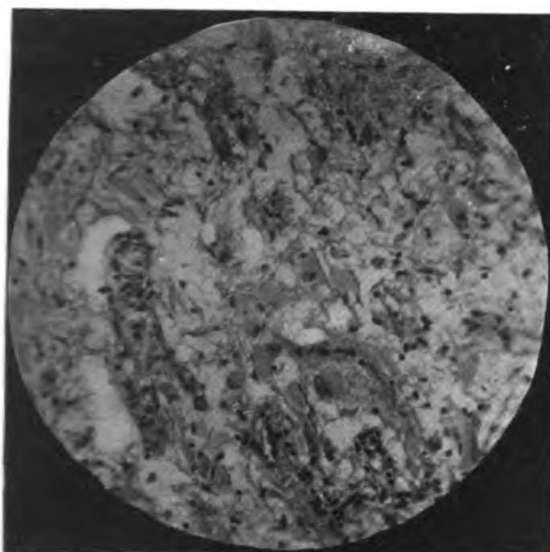


FIG. 49.

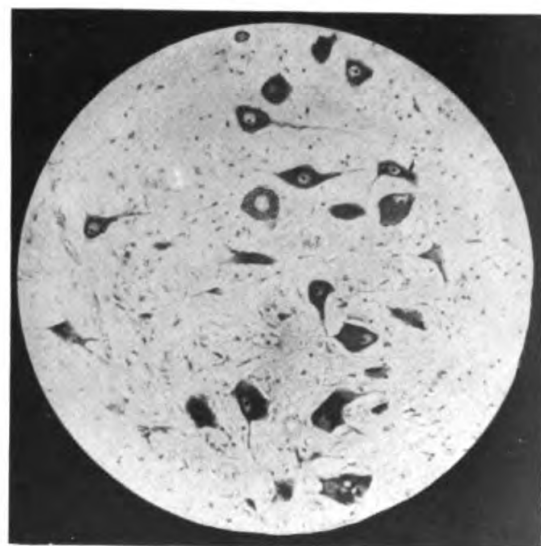


FIG. 50.



FIG. 51.

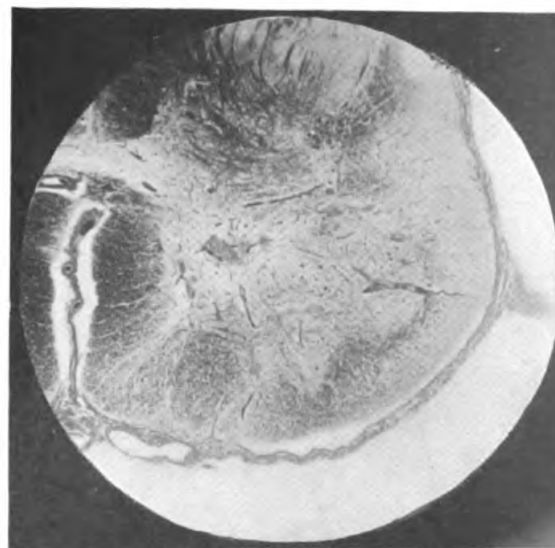


FIG. 52.

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FIG. 53.

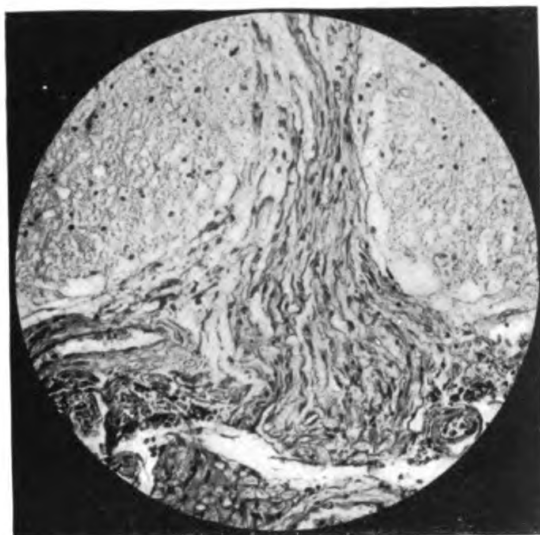


FIG. 54.

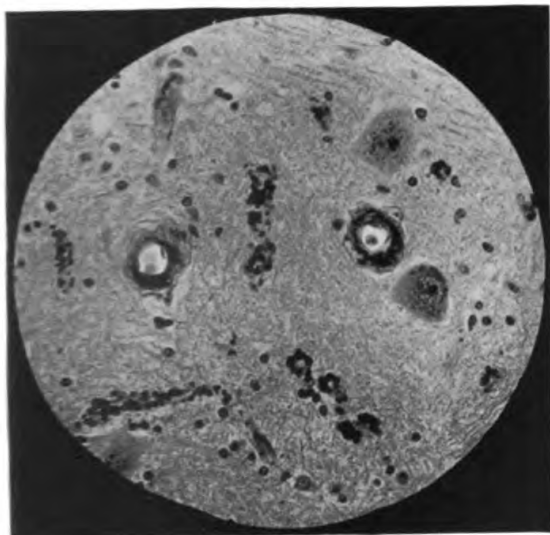


FIG. 55.

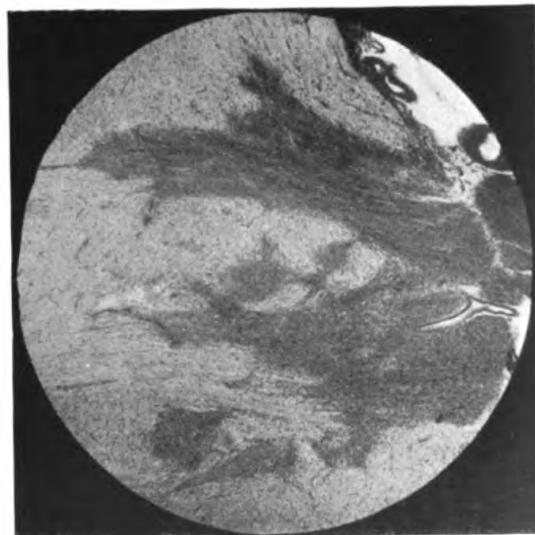


FIG. 56.

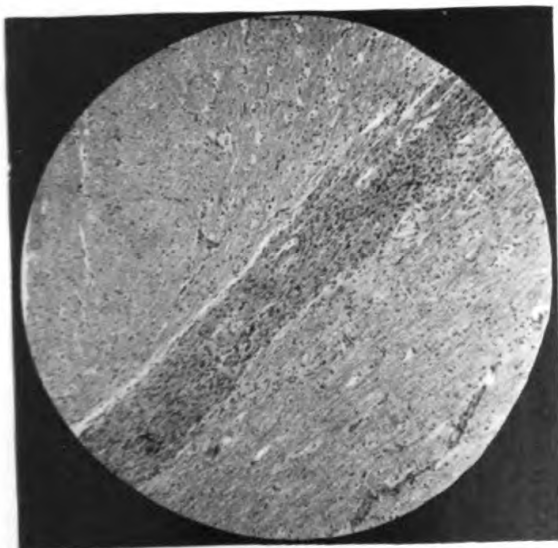


FIG. 57.

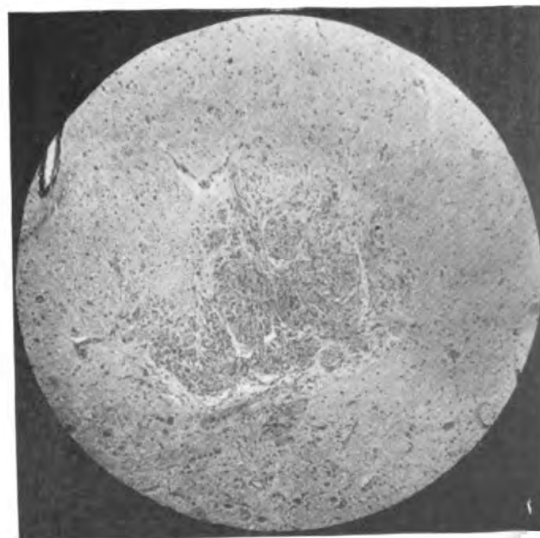


FIG. 58.



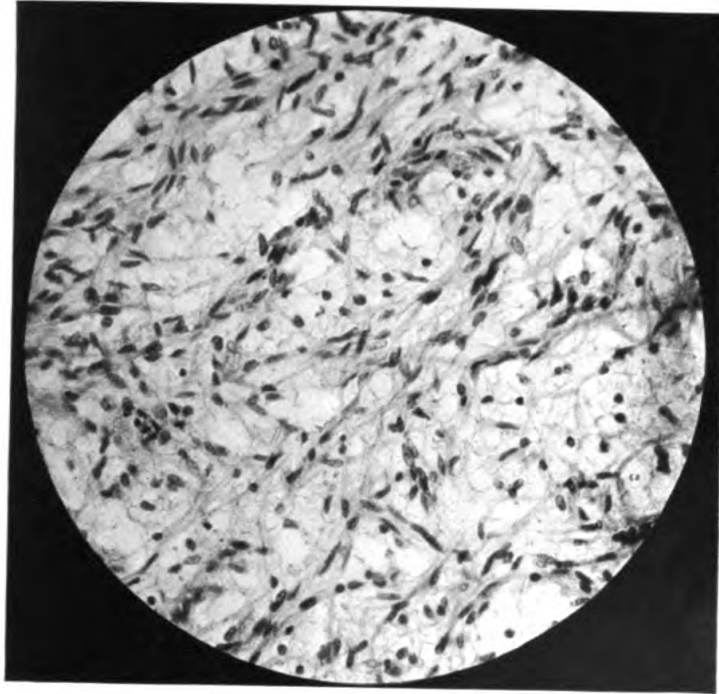


FIG. 59.

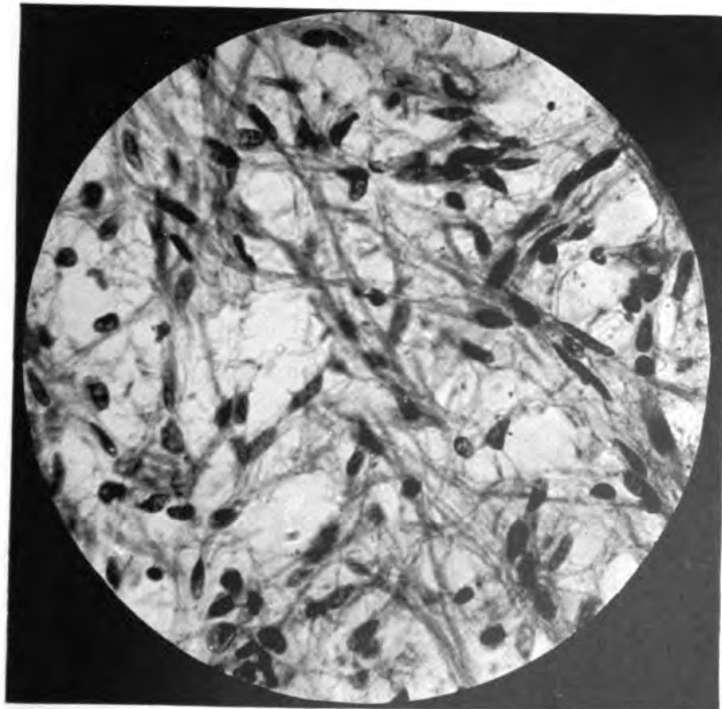


FIG. 60.



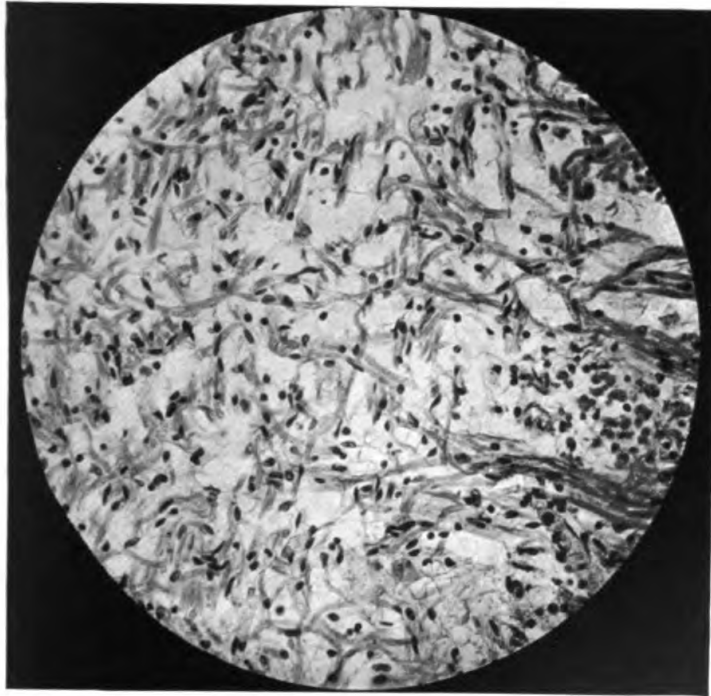


FIG. 61.

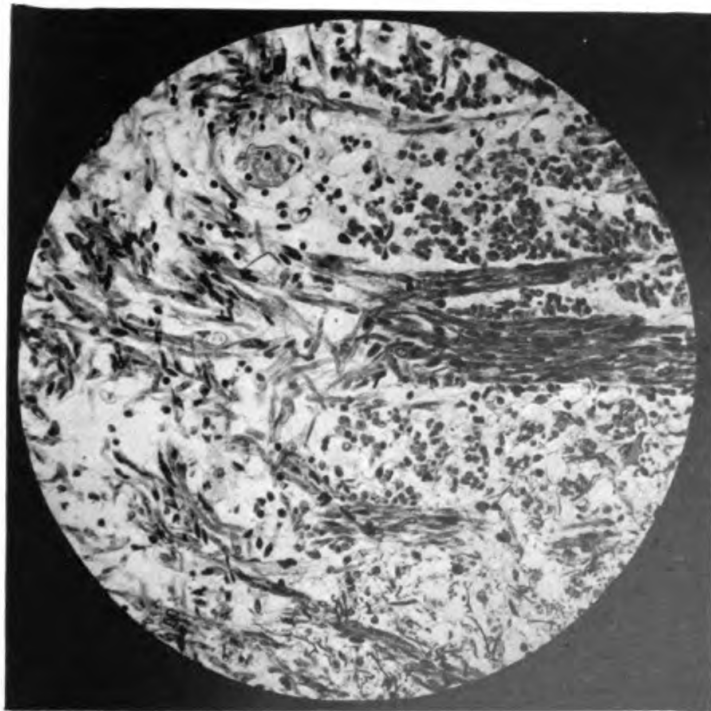


FIG. 62.





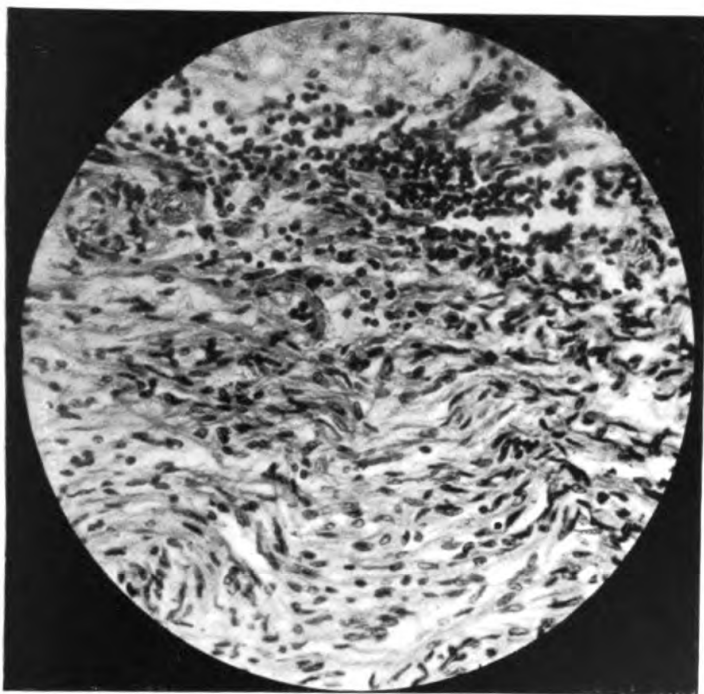


FIG. 63.

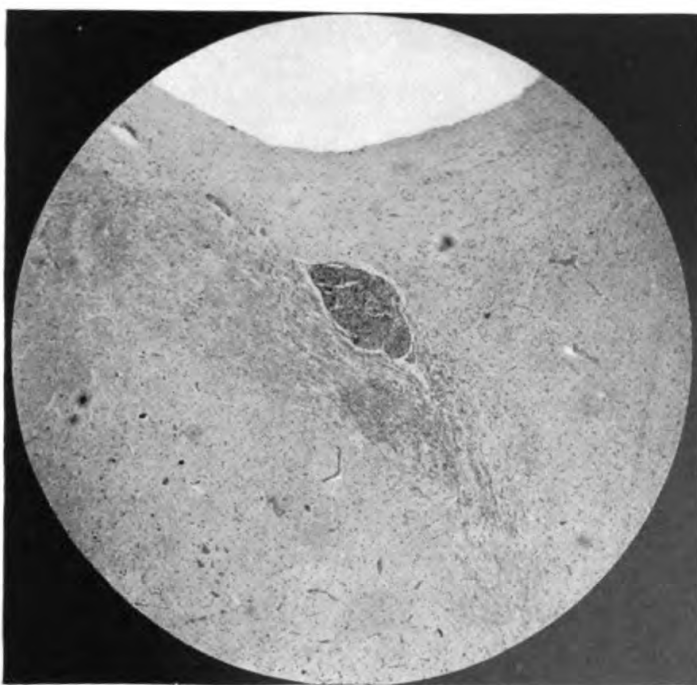


FIG. 64.

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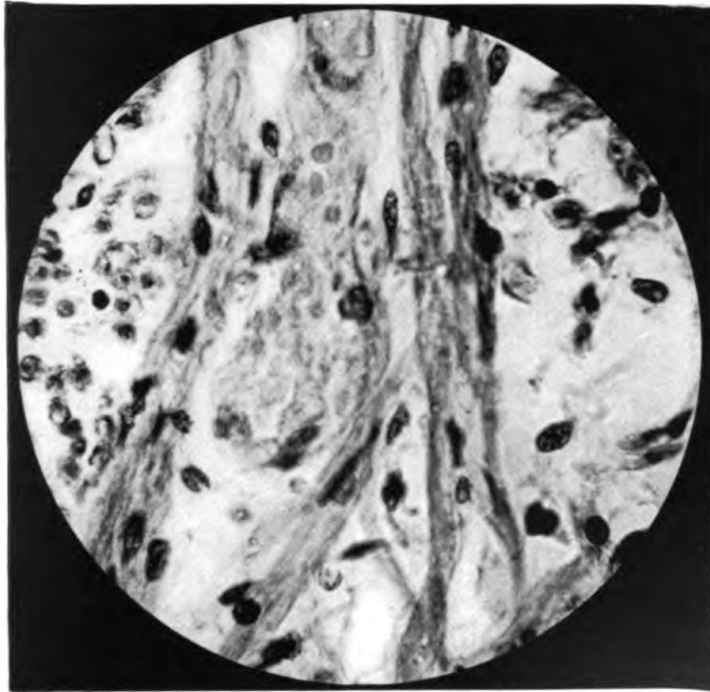


FIG. 65.

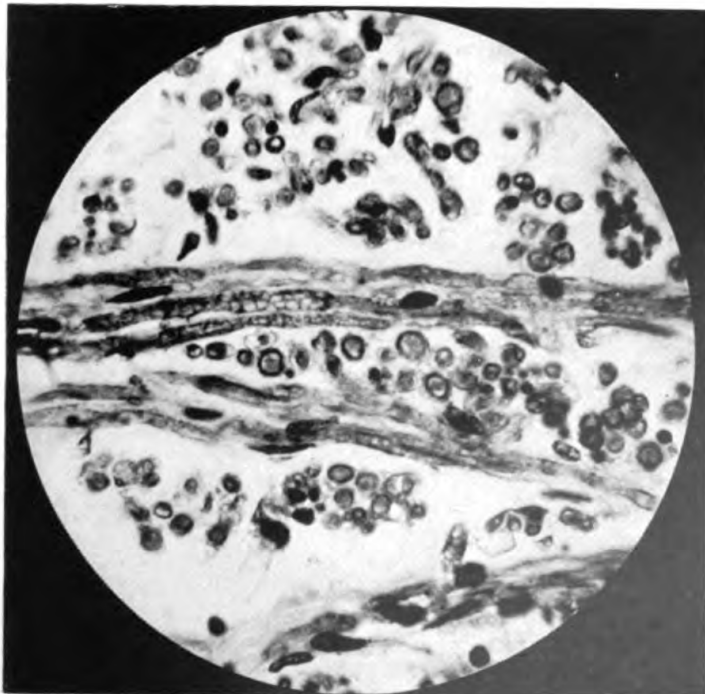


FIG. 66.



## NEUROMATA OF CENTRAL NERVOUS SYSTEM 163

- Fig. 50. Anterior horn cells, showing only slight changes. Note well-marked vacuolation in a cell at lower border of figure. Unna's polychrome methylene-blue stain.  $\times 100$ .
- Fig. 51. Transverse section of cord at level of 2nd lumbar segment: areas of marked fibrosis, often almost symmetrical in the anterior horns. Kulschitzky-Pal and picro-fuchsin.  $\times 10$ .
- Fig. 52. Dense area of fibrosis at base of anterior horn, and stretching amongst the antero-mesial and postero-lateral groups of cells. Kulschitzky-Pal and picro-fuchsin.  $\times 20$ .

### PLATE XII.

- Fig. 53. Fibrosis of posterior root. Extra-medullary root gives the impression of having been carried right into the cord substance with its extra-medullary structure. Van Gieson's stain.  $\times 35$ .
- Fig. 54. Fibrosis of intra-medullary course of anterior root. The neurilemma, together with a layer of the pia, seems as if carried inwards along individual bundles of fibres. Van Gieson's stain.  $\times 160$ .
- Fig. 55. Granular deposit, often coalescing to form concretions, found in the adventitial spaces of the smaller vessels of the tissue, in close relation to the malformation described on page 158. Van Gieson's stain.  $\times 250$ .
- Fig. 56. Fibrosis of intra-medullary course of 5th nerve. *Cf.* Fig. 53. Van Gieson's stain.  $\times 24$ .
- Fig. 57. Isolated nucleated patch (cut longitudinally) on the course of deep strands of 5th nerve. The affected fibres retain the normal arrangement of the fibre strands of the part involved. Van Gieson's stain.  $\times 60$ .
- Fig. 58. Isolated nucleated patch, similar to above, but cut transversely. Van Gieson's stain.  $\times 60$ .

### PLATES XIII.-XVI.

- Figs. 59-66.* Paraffin sections from medulla oblongata. *Cf.* Figs. 1-5 and Fig. 14.
- Fig. 59 and 60. Loose meshwork of interlacing nucleated fibres and elongated nucleated elements. Fusiform cells (*cf.* Fig. 1) are seen linked together, by their processes, to form cell chains, and by the fusion of the imbricated ends there is a transition into nucleated plasmodial bands or "tubes" (*cf.* Fig. 2). Note appearances as of dichotomous division, and that the nucleus lies definitely within the cell outline or within the "lumen" of the "tube." Fig. 59 ( $\times 200$ ), Fig. 60 ( $\times 400$ ). Van Gieson's stain.
- Figs. 61 and 62. Convergence of nucleated "tubes" to form more or less parallel bundles or strands, between which similar elements are found cut transversely. Presence of small amount of interfibrillar connective tissue and delicate capillaries. Fig. 61 ( $\times 160$ ), Fig. 62 ( $\times 160$ ). Van Gieson's stain.
- Fig. 63. Commencing intertwining of the parallel strands. Such intertwining forms the transition to the definite nodule in Fig. 64. Van Gieson's stain.  $\times 200$ .
- Fig. 64. Nodule on floor of 4th ventricle, situated laterally and posteriorly to the strands of the 7th nerve—a further stage of the intertwining in Fig. 63. Van Gieson's stain.  $\times 25$ .
- Figs. 65 and 66. Commencing myelination of the nucleated "tubes." Note the lattice-work appearance of the newly-formed myelin. Heidenhain's iron-haematoxylin stain. Fig. 65 ( $\times 450$ ), *cf.* Fig. 14, *a, b, c.* Fig. 66 ( $\times 450$ ), *cf.* Fig. 14, *d, e, f.*

## Abstracts

### ANATOMY.

#### **STUDIES OF THE DEGENERATION AND REGENERATION OF**

(118) **AXIS CYLINDERS IN VITRO.** RAGNVALD INGEBRIGTSEN, *Journ. Exper. Med.*, Vol. xvii., No. 2, Feb. 1, 1913, p. 182.

THE brains of chick embryos, of cats 6 weeks old, of rabbits 2 months old, and of dogs 3 weeks old, when cultivated *in vitro*, develop long filaments which, according to their growth and their anatomical and tinctorial characters, must be considered as true axis cylinders.

Similar structures develop from spinal ganglia of rabbits 7 months old, and from the spinal cord of cats 6 weeks old, and of rabbits 2 months old.

When severed from their origin by section, these threads undergo degenerative changes which do not appear after nine hours, but which are seen after twenty hours, and continue until in the course of the following two days the thread degenerates completely.

After twenty hours the development of new axis cylinders from the central part of the cut fibres is observed

A. NINIAN BRUCE.

### PHYSIOLOGY.

#### **THE EFFECT OF THYROIDECTOMY AND CASTRATION, RE-**

(119) **SPECTIVELY, ON THE WEIGHT OF THE RABBITS PITUITARY.** L. M. DEGENER and A. E. LIVINGSTON (*Proc. Amer. Physiol. Soc.*, Dec. 29, 1912, p. xxiv.); *Amer. Journ. of Physiol.*, Vol. 31, No. 5, Feb. 1, 1913.

THE authors find that while thyroidectomy in rabbits, including the removal of the internal parathyroids, is followed by pituitary hypertrophy, removal of their testes or ovaries has no such effect. The latter observation supports the findings of Marrassini and Luciani (*Arch. ital. de Biol.*, Vol. 56, 1912, p. 395) that in rabbits and several other animals castration has no constant effect on the weight or histological structure of the pituitary.

LEONARD J. KIDD.

## CLINICAL NEUROLOGY.

- COMBINED LESIONS OF THE POSTERIOR AND LATERAL (120) COLUMNS.** (*Lesioni combinate dei cordoni posteriori e laterali.*)  
G. MONDIO, *Riv. ital. di Neuropat., Psychiat. ed Elettroter.*, 1912, v., p. 529.

A TYPICAL case in a man, aged 32, in whom the disease had reached the second stage described by Russell, Batten, and Collier (*Brain*, 1900, xxiii, pp. 39-110). The increasing paresis was being transformed into spastic paraplegia, and was accompanied by hypo-æsthesia and hypoalgesia of the lower limbs, Babinski's and Romberg's signs, and immobility of the pupils. Unlike the previous cases, there was no evidence of grave anæmia, and the general nutrition was good. Mondio regards a gastro-intestinal affection, prolonged masturbation, exaggerated muscular exercise and exposure to cold and damp as causal factors in the present case.

J. D. ROLLESTON.

- HEADACHE IN ACUTE INFECTIOUS DISEASES TREATED AND (121) CURED BY LUMBAR PUNCTURE.** (*Céphalée dans les maladies infectieuses aiguës traitée et guérie par la ponction lombaire.*)  
H. ROGER and J. BAUMEL (de Montpellier), *Rev. de Méd.*, 1913, xxxiii, p. 40.

THE writers allude to the successful results obtained by Rocaz and Carles (*v. Review*, 1908, vi., p. 557) and Stein (*ibid.*, 1910, viii., p. 501), in typhoid fever by this method and record fifteen personal cases in adults. Eight had typhoid fever, two Malta fever, one influenza, two tuberculosis, and two acute gastritis. Relief was always obtained a few minutes after puncture. In some cases several punctures were necessary, in others a single one was sufficient. In almost all there were hypertension and excess of albumen. No microbes nor cellular reaction was found in any case. No harmful results occurred from the treatment.

J. D. ROLLESTON.

- MENINGEAL STATE IN TYPHOID FEVER. HYPERTENSION (122) AND TYPHOID INFECTION OF CEREBRO-SPINAL FLUID WITHOUT LEUCOCYTIC REACTION. MILD COURSE AFTER LUMBAR PUNCTURE.** (*État méningée au cours d'une fièvre typhoïde. Hypertension et infection éberthienne du liquide céphalorachidien sans réaction leucocytaire. Evolution bénigne après la ponction lombaire.*) C. LESIEUR and J. MARCHAND, *Bull. et Mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 785.

A WOMAN, aged 19, on the eighteenth day of a severe and complicated attack of typhoid fever, developed meningeal phenomena, which subsided after lumbar puncture on the twentieth day. The



fluid was clear, under hypertension, agglutinated typhoid bacilli, and contained a pure culture of these organisms. Recovery took place with persistence of exaggeration of the reflexes, and ankle clonus, especially on the right side. J. D. ROLLESTON.

**PURULENT TYPHOID MENINGITIS IN A TYPHOID STATE**

(123) **WITHOUT INTESTINAL LESIONS.** (*Méningite purulente éberthienne au cours d'un état typhoïde sans lésions intestinales.*)

C. LESIEUR and J. MARCHAND, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 780.

A WOMAN, aged 41, who three years previously had had severe headache and gummata on the cranium and limbs, was admitted to hospital with symptoms of typhoid fever. Widal's reaction and the blood culture were positive. Subsequently signs of meningitis occurred, and death took place. Lumbar puncture yielded a purulent fluid containing typhoid bacilli. The necropsy showed a purulent cerebro-spinal meningitis, but there were no lesions in the intestine, spleen, or mesenteric glands. The previous attack of syphilis was probably the cause of the meningeal localisation of the typhoid infection. J. D. ROLLESTON.

**SEROUS MENINGITIS, PAPILLŒDEMA, AND MULTIPLE POLY-**

(124) **NEURITIS OF THE CRANIAL NERVES IN A YOUNG ALCOHOLIC SMOKER.** (*Méningite séreuse, œdème papillaire et polynévrite multiple des nerfs craniens chez un jeune fumeur alcoolique.*) J. N. ROY, *Rev. de Lar.*, 1913, i., p. 97.

THE patient was a man, aged 23, who had been a heavy smoker and drinker for four years, and had had epileptiform attacks from time to time. One morning, after three days' excessive indulgence, he woke up completely blind and deaf, and presented symptoms of meningitis, which were found to have come on three weeks previously. Three days later, complete paralysis of the palate and laryngeal hemiplegia developed. Lumbar puncture gave issue to a clear fluid under hypertension, containing an excess of lymphocytes and polymorphs, but no micro-organisms. After five weeks' treatment complete recovery took place.

J. D. ROLLESTON.

**ABNORMAL FORMS OF TUBERCULOUS MENINGITIS IN THE**

(125) **ADULT.** (*Contribution à l'étude des formes anormales de la méningite tuberculeuse chez l'adulte.*) S. LUTEL, *Thèses de Paris*, 1912-13, No. 149.

THE writer distinguishes the following clinical types of tuberculous meningitis in the adult: 1. A paralytic form is much the most frequent. 2. A convulsive form commencing with an attack

of Jacksonian epilepsy and choreo-athetotic movements. 3. A sensorial form starting with aphasia or deafness. 4. A cerebro-spinal form.

The thesis contains the histories of thirty-one cases, including four hitherto unpublished, of patients aged from 18 to 48 years.

J. D. ROLLESTON.

**ACUTE SYPHILITIC MENINGITIS.** (*Contribution à l'étude de la* (126) *méningite aiguë syphilitique.*) B. BRONSTEIN, *Thèses de Paris*, 1912-13, No. 69.

THE thesis contains the histories of twelve cases, including a personal one, recently published by Achard and Desbouis (*v. Review*, 1913, xi., p. 38).

J. D. ROLLESTON.

**PROGRESSIVE LENTICULAR DEGENERATION: A FAMILIAL** (127) **NERVOUS DISEASE ASSOCIATED WITH CIRRHOSIS OF THE LIVER.** S. A. KINNIE WILSON, *Brain*, Vol. xxxiv., Part iv., 1912, pp. 295-509.

PROGRESSIVE lenticular degeneration is a disease which occurs in young people, and which is often familial but not congenital or hereditary; it is essentially and chiefly a disease of the extra-pyramidal motor system, and is characterised by involuntary movements, usually of the nature of tremor, dysarthria, dysphagia, muscular weakness, spasticity, and contractures with progressive emaciation: with these may be associated emotionalism and certain symptoms of a mental nature. It is progressive, and, after a longer or shorter period, fatal. Pathologically it is characterised predominantly by bilateral degeneration of the lenticular nucleus, and in addition cirrhosis of the liver is constantly found, the latter morbid condition rarely, if ever, giving rise to symptoms during the life of the patient.

The author has collected thirteen cases of this disease, with six of which his own name is associated. Acute cases may last only a few months; the average duration of chronic cases is four years; one chronic case has as a maximum continued for seven years. The mental symptoms may be very slight and are sometimes absent, or they may be transient and such as one sees in a toxic psychosis, but not severe, or more chronic, consisting in a general restriction of the mental horizon, and a certain facility or docility without delusions or hallucinations, and not necessarily as progressive as the somatic symptoms.

In pure cases the affection constitutes an extrapyramidal motor disease, for the reflexes are normal from the point of view of the function of the pyramidal tracts. The neurological symptoms constitute a *syndrome of the corpus striatum*, which

has not hitherto been differentiated in this disease. The syndrome which is here put forward may be expressed as follows: in pure, uncomplicated, bilateral lesions of the lenticular nucleus and more generally of the corpus striatum, provided they are of sufficient size and of adequate duration, the clinical symptoms are bilateral involuntary movements, practically always of the tremor variety; weakness, spasticity or hypertonicity (sometimes spasmodic contractions), and eventually contracture of the skeletal musculature; dysarthria or anarthria and dysphagia, and a degree of emotion-alism; but without any sensory disturbance, without any true paralysis, and without any alteration in the cutaneous reflexes. If the abdominal reflexes are absent (apart from muscular rigidity) or the plantars of extensor type, then the syndrome is no longer pure.

The chief pathological feature of the disease is bilateral symmetrical degeneration of the putamen and globus pallidus, in particular the former. This degeneration is the sequel to the selective operation of some morbid agent on the cells and fibres of the putamen and lenticular nucleus generally. The caudate nucleus is often somewhat atrophic, but never to the same extent, while other large collections of grey matter in the immediate neighbourhood of the lenticular nucleus—*e.g.*, the optic thalamus, which has partially the same blood supply—is not affected at all in a pure case unless it be indirectly and to a very slight extent. The morbid agent is probably of the nature of a toxin, not of syphilitic origin. A constant, essential, and in all probability primary feature of the pathology of the disease is cirrhosis of the liver, not syphilitic or alcoholic. It is probable that the toxin is associated with the hepatic cirrhosis, and may be generated in connection therewith. The pyramidal tracts are intact from Betz-cells to muscles in a pure case.

The question of involuntary movements is discussed. These are of three main varieties, athetosis, chorea, and tremor. Since a lesion of the pyramidal system is not by itself sufficient to produce involuntary movement, and since they do not occur if the pyramidal tracts be severely injured, it would appear that extrapyramidal paths must be injured. The two here conceived are the cerebello-rubro-thalamo-cortical path and the lenticulo-rubrospinal system. The corpus striatum exercises a steadying influence on the action of the cortico-spinal system by means of the above two paths, and injury to it removes this steadying influence, and impairs pyramidal function as shown by hypertonicity or rigidity as well as in tremor on voluntary movement. It does not, however, produce any paralysis in the strict sense. The direct connection of the corpus striatum with the cortex is minimal. There is no necessity to postulate articulatory "centres" in the putamen or

globus pallidus. Dysarthria may result without any pyramidal involvement of genu fibres and with intact cranial nuclei, from hypertonicity of the musculature concerned. Tremor, as in paralysis agitans, is due to disturbance or failure of function of the lenticulo-rubrospinal system, while hypertonicity or rigidity of the musculature, due to defect of the "inhibitory" action of the corpus striatum, is possibly associated with structural or functional defects in the cerebello-rubro-thalamo-cortical path. The absence of normal cortico-petal impulses travelling *via* this path also allows the movements of athetosis to occur.

This paper is one of the most important of recent contributions to clinical neurology, and should be read in the original. It is illustrated by ninety-nine figures, and there is a very complete bibliography.

A. NINIAN BRUCE.

**TUBERCULOUS LEPROSY, GIANTISM, AND ACROMEGALY.**

(128) (*Lèpre tuberculeuse, gigantisme et acromégalie.*) DE BEURMANN, L. RAMOND, and LARROQUE, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1912, xxxiv., p. 714.

A RECORD of a case in a man, aged 32, who had the characteristic deformities of acromegaly in the hands and feet. The X-rays showed widening of the sella turcica, slight enlargement of the frontal sinuses, and elongation of the bones of the hands. The acromegaly was not due to leprosy, but to a normal evolution of a pituitary syndrome. The patient had always been tall, if not a giant.

J. D. ROLLESTON.

**A CASE OF POSITIVE WASSERMANN'S REACTION IN SAR-**

(129) **COMA.** (*Et Tilfælde af positiv Wassermann's Reaktion ved Sarcom.*) O. LASSEN, *Hospitalstidende*, 1912, lv., p. 1479.

A FATAL case of lymphosarcoma of the neck, with pulmonary and mesenteric metastases, in a youth of 17, in whom there was no history nor evidence of syphilis. The reaction was performed at the State Serum Institute.

J. D. ROLLESTON.

**ON THE DIAGNOSIS OF TUMOURS OF THE FOURTH VENTRICLE**

(130) **AND OF IDIOPATHIC HYDROCEPHALUS, WITH A NOTE ON BRAIN PUNCTURE.** (*Zur Diagnose der Tumoren des IV. Ventrikels und des idiopathischen Hydrocephalus nebst einer Bemerkung zur Hirnpunktion.*) K. BONHOEFFER, *Arch. f. Psychiat.*, Bd. 49, H. 1, 1912.

THE report of three cases of tumour of the fourth ventricle, and of two cases of idiopathic hydrocephalus, which clinically resembled the cases of tumour. The symptoms common to the three cases of

tumour were, in addition to the general cerebral symptoms, the attacks of tonic convulsions, sudden episodes of dullness and collapse, cerebellar ataxia, disturbance of associated eye movements, and unilateral diminution of the corneal reflex. In one case the face showed a somewhat coarse, bloated appearance, probably associated with pressure on the hypophysis. An attempt was made in the cases of tumour to prevent the development of hydrocephalus, and to relieve the severe pain by means of puncture of the ventricle. In one case death followed seven hours after the puncture. In one case the ventricle was frequently punctured with some subjective improvement, but with no improvement in the choked disc; a fistula developed after this puncture.

C. MACFIE CAMPBELL.

**CEREBRAL PARALYSIS WITH INTACT PYRAMIDAL TRACT.**

(131) (Zerebrale Lähmung bei intacter Pyramidenbahn. Ein Beitrag zu den Entwicklungskrankheiten des Gehirns.) E. HÖSTERMANN, *Arch. f. Psychiat.*, Bd. 49, H. 1, 1912.

A REPORT of four cases of hemiplegia, without evidence of degeneration of the pyramidal tract, with a review of the literature dealing with similar cases. The author concludes that in childhood hemiplegia may develop with a perfectly typical clinical picture, but without involvement of the pyramidal tract, the cause of which is a lesion of the cortex, especially of the anterior central convolution. In this region one finds the disappearance of cell-layers, an atypical arrangement of the cells, and arrested development of some of the cells. These anomalies prevent normal impulses being carried to the motor cells, which, although anatomically connected with their own system of fibres, are physiologically isolated. The anatomical conditions found by various authors are as follows:—

1. Paralysis clinically, with anatomically an absolutely intact pyramidal tract and atrophy of one part of the cortex, with normal giant pyramids.
2. Clinically cerebral infantile hemiplegia, with anatomically intact pyramidal tract and an old focus in the red nucleus.
3. Paralysis with intact pyramidal tract, and an old focus in the thalamus.
4. Paralysis with intact pyramidal tracts, but absence of the giant pyramids.
5. A case of Friedreich's disease without paralysis, but with sclerosis of the pyramidal tracts.
6. Cases of idiocy with absence of the giant pyramids, but intact pyramidal tract and unimpaired motility.

C. MACFIE CAMPBELL.

**MYASTHENIA.** (*Die Myasthenie.*) G. J. MARKELOFF, *Arch. f. (132) Psychiat.*, Bd. 49, H. 2, 1912.

THE author reports seven cases of myasthenia personally observed, and reviews the literature dealing with myasthenia. He emphasises the fact that the disorder was not confined to the voluntary muscles, but that it affected the whole musculature, including the smooth involuntary muscles; thus the accommodation was easily fatigued, and the heart muscles affected. Disorders of the bladder and intestines of various kinds were observed. The disorders of the bladder are considered by the author to be due to the great muscular fatiguability. The origin of the severe diarrhoea occasionally observed is attributed to thyroid disorder. Muscular atrophy is more frequently present than the literature would lead one to believe, but it is sometimes concealed by pseudohypertrophy. The author brings myasthenia into close relation with the muscular dystrophies. He considers that the disease is based upon a certain diathesis associated with a disorder of the internal secretions, and that the clinical symptoms develop when the equilibrium of the individual is upset by toxic, auto-toxic, or psychic factors.

C. MACFIE CAMPBELL.

**MALUM PERFORANS IN DIABETES MELLITUS.** A Report of (133) *Seven Cases.* J. T. SAMPLE and W. L. GORHAM, *Bull. Johns Hopkins Hosp.*, 1913, xxiv., p. 28.

THE patients' ages ranged from 48 to 65. Anæsthesia of the ulcer and surrounding tissue was not marked in any case. The knee jerks were absent in four and present in three. The authors reject the view that the ulcer is due to changes in the peripheral nerves as well as the vascular and mechanical theories, and hold that the true cause lies in a disturbance of tissue vitality due to hyperglycæmia.

J. D. ROLLESTON.

**RELAPSING OCULO-MOTOR PARALYSIS IN URICÆMIC 'SUB-**  
(134) **JEOTS.** (*Su di una paralisi recidivante dell' oculo-motore in soggetti uricemici.*) N. SCALINCI, *Gazz. internaz. di med. chir.*, &c., 1912, p. 1157.

A RECORD of two cases in men, aged 34 and 35 years respectively. Neither had had syphilis, but both were uricæmic, and one had a gouty heredity. The latter developed right ptosis without any previous headache and paralysis of VI on the same side. This happened several times in the course of nine years, sometimes alternating with a similar paralysis on the opposite side. The paralysis lasted on the average fifteen to twenty days. Finally, recovery took place after anti-arthritic treatment. In the other patient right ptosis was preceded by intense pain in the temporal

region, and was accompanied by paralysis of VI. In the course of two years he had three similar attacks of diminishing intensity. After the first attack involvement of V was shown by anæsthesia of the skin of the cheek and buccal mucosa of the same side.

J. D. ROLLESTON.

**RECENT SYPHILITIC HEMIPLEGIA CONSIDERABLY IMPROVED**

(135) **BY SALVARSAN.** (*Hémiplégie syphilitique récente considérablement améliorée par le salvarsan.*) PIERRET and HANNE-DOUCHE, *Echo méd. du Nord*, 1913, xvii., p. 5.

A MAN, aged 39, who had contracted syphilis six years previously, and had left it untreated, developed sudden right hemiplegia with anarthria. Three intravenous injections of 0.40 gr. salvarsan were given, and within a month the patient could walk without support and use his right hand. Recovery would probably have been complete but for the occurrence of colic and diarrhoea which necessitated interruption of the treatment. J. D. ROLLESTON.

**THE EFFECT OF SALVARSAN UPON THE AUDITORY NERVE.**

(136) A. BARDES, *Amer. Practitioner*, 1913, xlvii., p. 27.

BARDES tested the hearing of forty-seven patients who had received salvarsan, mostly intravenously. Six, whose hearing before treatment had been normal, became deaf within a week or month of injection. In four the disturbance was not noticed until after the second injection. There was no evidence of middle ear disease, but the symptoms were those of a lesion affecting the auditory nerve. J. D. ROLLESTON.

**ON THE PATHOLOGICAL ANATOMY OF THE PERIPHERAL**

(137) **NERVES IN METASYPHILITIC DISORDERS.** (*Beiträge zur pathologischen Anatomie der peripheren Nerven bei den metasyphilitischen Erkrankungen.*) *Arch. f. Psychiat.*, Bd. 49, H. 3, 1912.

THE author reviews the literature and records the results of the personal examination of the peripheral nerves in six cases of general paralysis. He concludes that in metasyphilitic disorders there are the same mesodermal changes in the peripheral spinal nerves as in the other parts of the central nervous system. The changes in the mesodermal supporting tissue of the nerves do not run parallel with those in the nerve fibres. The disorder of the nerve fibres of the peripheral nerves is functionally and anatomically independent of the process in the central nervous system. The mesodermal changes in the peripheral nerves have no importance for the symptomatology of the metasyphilitic disorders.

C. MACFIE CAMPBELL

**ADIPOSIS DOLOROSA: STRIKING BENEFIT FROM FRESH (138) THYROID GLAND.** (*Adipose douloureuse avec asthénie: action remarquable de l'opothérapie thyroïdienne.*) H. CLAUDE and A. SÉZARY, *Gaz. des Hôp.*, Ann. 86, No. 5, Jan. 14, 1913, p. 69.

APART from the rather early age of onset (30) of adiposa dolorosa in the woman whose case is here reported, the absence of psychical changes is noteworthy: in both respects it resembles the case of Delucq and Alaux (*v. Review*, Vol. 2, 1904, p. 771). After complete failure of thyroid tablets, taken for twelve days, and only trifling benefit from adrenal and ovarian therapy, fresh thyroid gland feeding gave striking relief, so that after three weeks' treatment the adiposis was greatly diminished and the asthenia also. Relapse followed cessation of this fresh gland feeding, so that fresh tender swollen plaques appeared: these yielded on resumption of the treatment. So long as the patient continues it she remains well in all respects, but relapses on its stoppage. After four months of this treatment her weight returned to her normal or slightly below it.

LEONARD J. KIDD.

**SUPRARENAL MUSCULAR SYNDROMES.** (*Les syndromes surrénomusculaires.*) A. SÉZARY, *Sem. méd.*, 1913, xxxiii., p. 61.

CERTAIN slow changes in the suprarenals causing impairment of their function may either alone, or in association with lesions in the other glands of internal secretion, produce a myasthenic syndrome which it is impossible to distinguish from myasthenia unconnected with suprarenal insufficiency. In a given case of myasthenia, therefore, it is advisable to employ suprarenal opotherapy. Encouraging results have been obtained by suprarenal opotherapy alone or in combination with pituitary medication.

Certain amyotrophic states may also be due to chronic suprarenal insufficiency, and benefit may be derived in such cases from suprarenal opotherapy.

J. D. ROLLESTON.

**A CONTRIBUTION TO THE PSYCHIATRY AND NEUROLOGY (140) OF SLEEPING SICKNESS, BASED ON OBSERVATIONS IN THE SLEEPING-SICKNESS CAMPS, KIGARAMA AND USUMBURA.** (*Psychiatrisch-neurologischer Beitrag zur Kenntnis der Schlafkrankheit nach Beobachtungen in den Schlafkrankenlagern Kiagara und Usumbura in Deutsch-Ost-Afrika.*) W. VIX, *Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

IN Kigarama 70 patients were observed, and the progress of the disease was followed. In 65 out of the 70 cases trypanosomes were found in the blood or the cerebro-spinal fluid. Out of 27 cases punctured, 21 showed trypanosomes in the cerebro-spinal



fluid; their motility rendered them easily visible in the fresh centrifugate. The clinical picture was dominated by the mental symptoms, and these were demonstrated in 55 out of 70 cases. The patients were dull, apathetic, listless, showed little initiative: a very pronounced somnolence was comparatively rare (5 cases). In 41 cases intelligence defects could be demonstrated. In 28 cases there were conditions of excitement of greater or less duration, and of manic type. Hallucinations were probable in one case. Attacks of convulsions and loss of consciousness were frequent (18 cases), sometimes with residual focal symptoms. The attacks were similar to those in general paralysis.

In the large majority of the cases neurological symptoms were demonstrated; dizziness was a frequent symptom, the pupils rarely showed defective reaction, the external ocular muscles were not affected. In 16 cases exophthalmus was observed, usually associated with tachycardia. Facial paresis was present in 16 cases, while the innervation of the tongue was involved in 23 cases. The speech was rarely defective. Ataxia was present in 25 cases, usually accompanied by tremor.

In advanced cases contracture developed. No sensory defect could be demonstrated.

The clinical picture resembled general paralysis, but the psychotic symptoms were more episodic than in the continuously progressive course of the latter.

Anatomical examination of 3 brains disclosed a diffuse disorder with perivascular infiltration, chiefly involving the larger vessels and the white matter, with progressive and regressive changes of the glia, and Nissl's "acute alteration" of the nerve cells. The architectonic of the cortex was undisturbed.

C. MACFIE CAMPBELL.

## PSYCHIATRY.

**A DEMONSTRATION OF TREPONEMA PALLIDUM IN THE (141) BRAIN IN CASES OF GENERAL PARALYSIS.** HIDAYO NOGUCHI and J. W. MOORE, *Journ. Exper. Med.*, Vol. xvii, No. 2, Feb. 1913, p. 232.

THE author examined seventy paretic brains, and succeeded in finding the *Spirochæte pallida* in twelve cases. The area chosen for examination was usually specimens of brain tissue from the first right frontal sphere, but occasionally from the left hemisphere. The twelve positive cases were clinically undoubted cases of general paresis, but of a rapid course, the longest in duration lived only thirty months. The post-mortem appearances, both macroscopical and histological, were the typical lesions constantly associated with general paresis. No softening, gummata, or marked endarteritis were found. Ten were men, two were women, and five cases were of the tabetic type. The method used for

staining was a modified Levaditi silver method, the technique of which the authors do not give. The spirochaetes were found in all layers of the cortex except the outer layer: occasionally they were found subcortically, they were never demonstrated in the vessel sheath, and did not have any particular relationship to the vessels; in the pia no spirochaetes were found. Drs Noguchi and Moore found no ratio between the numbers of spirochaetes and the severity of the paresis, although in one case in which they were most numerous the parietic changes were very marked. They conceive it is possible that the spirochaetes will be found more readily in cases which run a fairly rapid course.

WINIFRED MUIRHEAD.

**ON THE TREATMENT OF GENERAL PARALYSIS.** (*Die Behandlung (142) lung der progressive Paralyse.*) W. SPIELMEYER, *Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

THE author discusses the clinical and anatomical data which suggest that general paralysis may come to a spontaneous standstill, and with regard to this question he adopts a very conservative attitude. He discusses in great detail the analogy between general paralysis and trypanosomiasis. The further treatment of general paralysis will be directed along the lines indicated by recent studies of trypanosome disorders. In the trypanosome disorders treatment is ineffectual owing to the impossibility of reaching the cerebro-spinal fluid through the meninges, a difficulty which is of great importance in the treatment of general paralysis. The exact method of administration of the therapeutic agent requires yet to be determined.

C. MACFIE CAMPBELL.

**THE TREATMENT OF GENERAL PARALYSIS.** (*Die Behandlung (143) der progressiven Paralyse.*) E. MEYER, *Arch. f. Psychiat.*, Bd. 50, H. 1, 1912.

THE author discusses systematically the practical side of the treatment of general paralysis. Different forms of treatment have been tried, directed both against assumed toxic and auto-toxic processes and against syphilis. An endeavour to establish a non-specific immunity by means of tuberculin, deuto-albumose, bacterial vaccines, nucleic acid, has given very modest results, and the reports as to the results obtained in different hands are somewhat contradictory. With regard to the action of mercury there is a similar difference of opinion. The reports with regard to the influence of salvarsan are equally contradictory. The alteration of the reaction of the cerebro-spinal fluid does not necessarily mean a modification of the clinical course of the disorder. Out of 286 cases of general paralysis treated with salvarsan, 266 showed no improvement. A bibliography is appended.

C. MACFIE CAMPBELL.

**MANIC-DEPRESSIVE PSYCHOSIS IN TWINS.** (Frenosi maniaco (144) depressiva in gemelle.) C. PIANETTA, *Riv. ital. di Neuropat., Psychiat. ed Elettrotet.*, 1913, v., p. 535.

A CASE of two sisters, aged 38, physically closely alike, whose mother had had some psychological disturbance. Theresa, the elder twin, developed the symptoms in the seventh month of lactation, a few days before her sister Maria. The symptoms were the same in both. Both were treated in distinct private asylums, but whereas Theresa got well in three months, Maria took nine months to recover.

Of the twenty-three published cases of insanity in twins, all but one have been of the same sex. Fifteen were females, seven were males, and one brother and sister. In almost all the cases heredity was noted among the causes. In all the cases there has been a great resemblance in the outward appearance associated with a uniformity of character and strong ties of affection as in the present case.

Some degree of mental debility is not uncommon in twins, and as a rule the mentality of twins is not above the average. With the exception of the legendary Romulus and Remus no twins have ever attained distinction. J. D. ROLLESTON.

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## Review.

**INTERNAL SECRETION AND THE DUCTLESS GLANDS.** SWALE (145) VINCENT. 1912. Ed. Arnold, London.

THIS book, which has a preface by Professor Schäfer, gives a critical account of our present knowledge of internal secretion, a subject to which the author has devoted his attention for many years.

The history of the conception of internal secretion is detailed, and the various bodies entitled to inclusion among the ductless glands described.

The author is very successful in prescribing and summarising the extensive literature in a clear and interesting manner. The book is far from being a mere compilation, nor are the views expressed always those which may be said to hold the field in the department of physiology treated.

Professor Vincent advocates restriction of the use of the term "internal secretion," which, in his view, has been unjustifiably extended to include secretions from non-glandular cells, and defines the process as consisting in the preparation and setting free of certain substances of physiological utility by certain cells of a glandular type, the substances set free passing not to a free surface but into the blood stream. The question arises as to what cells we must regard as glandular. The medullary cells of the

adrenal body are not "epithelial," nor are those of the nervous portion of the pituitary body, and yet it is in these cells rather than in the associated epithelial masses that substances are contained having pronounced pharmacological properties, and the author believes that these groups of cells constitute internally secreting glands. With respect to the pituitary body, however Schäfer's view must be considered, viz., that it is the function of the pars intermedia, an epithelial structure, to produce a colloid material which contains active principles or hormones acting upon the heart, blood vessels, and kidneys.

Regarding the islets of Langerhans in the pancreas, the author is of opinion that they do not constitute an organ distinct from the pancreas, but that they are modified portions of pancreatic tissue, capable under certain conditions of increasing at the expense of the latter, and of being reconverted, as the physiological conditions change, into secreting tubules.

The conclusion that the islets are not organs *sui generis* is not necessarily antagonistic to the view that they are the part of the pancreatic tissue concerned with carbohydrate metabolism. A temporary structural modification of alveolar into islet tissue may or may not correspond to a specialisation of function.

The precise relation between glycosuria and disease of the pancreas is not yet sufficiently elucidated.

In discussing mammary secretion, the author takes the view that the mammary hormone is produced by the corpus luteum, and that enlargement of the mamma is not dependent upon fertilisation. With regard to the work of Lane Claypon and Starling, who find that injections of foetus into a virgin rabbit cause growth of the mammary glands, it is pointed out that the foetus in its entirety cannot be regarded as a gland with an internal secretion, and that the mammary hormone derived from foetal tissues is not specific.

There has been a tendency recently to attribute various forms of glycosuria to the secretion of the suprarenal bodies. The author thinks that the final solution of the problem may be arrived at by an accurate knowledge of the interaction between the adrenals and the pancreas through the mediation of the sympathetic nervous system.

The function of the cortex of the suprarenal is not known. There are some reasons for supposing that it may yield a hormone, derived from its lipoid granules, which influences the growth and nutrition of certain tissues and organs, and especially the organs of reproduction.

With regard to the thyroid and parathyroid bodies, the author adopts the view that the fundamental histological features of the two tissues are, if not identical, at any rate very significantly similar. Parathyroid tissue left *in situ* when the thyroid is

removed by operation, approximates in appearance to the latter, so that the final product in some cases cannot in microscopic examination be distinguished from thyroid tissue. Thyroid and parathyroid form a single physiological apparatus, the two kinds of tissue being intimately associated embryologically and working together physiologically.

The pituitary body, as regards histology, probable function and pathology, is fully discussed. Schäfer's work has demonstrated that, besides their action on the blood pressure, extracts of the posterior lobe have a diuretic effect, and the author thinks it probable that this may be of clinical value.

WM. A. JOLLY (Cape Town).

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# **Review**

of

# **Neurology and Psychiatry**

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## **Original Articles**

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### **MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM: THEIR STRUCTURE AND HISTOGENESIS.**

By the late ALEXANDER BRUCE, M.D., LL.D., F.R.C.P.E.; and  
JAMES W. DAWSON, M.D. (Carnegie Research Fellow).

*(Continued from page 160.)*

#### **II.—INTERPRETATION AND CONCLUSION.**

IN trying to answer the question, What conclusions may be drawn from our observations? or, in other words, What is their explanation? we are met at the outset by the necessity of bringing, if possible, the various formations described into a genetic relation to one another. In the attempt to correlate the appearances in the cord with those in the medulla oblongata and pons the problem in the cord is, obviously, the genesis of the nerve fibres, for these elements are the essential constituent of the nodules, while the problem in the medulla and pons is the genesis of the fusiform cells, for the various formations can be related to them.

In the cord the fibres were disposed, more or less, in the form of strands or nodules in numerous positions. They were found always in relation to pia, pial septa, or the adventitia of vessels, and only in their terminal ramifications did the individual fibres come into direct contact with the actual nerve tissue. The fibres of the nodules could in all instances be traced to strands passing laterally or ventrally from the immediate vicinity of the emerging

anterior roots. Those passing laterally in the pia entered inwards by all the peripheral vessels of the lateral region of the cord; they formed nodules in the vessel-walls and at the junction of white and grey matter, where their fibres terminated by gradually unweaving themselves from the nodule into the general texture of the grey matter. The fibres passing ventrally curved round into the anterior fissure, as a rule to its base, forming a large nodule in the region of the central canal, passed along the commissural vessels to form nodules in the centre of each grey matter, and often leashes of fibres passed along in the vessel-walls anteriorly, laterally, and posteriorly. The terminal fibres of these nodules again gradually unwound into the general meshwork of the grey matter, interlacing with fibres from the nodules which had formed in relation to peripheral vessels.

With Weigert's medullated sheath stain these fibres are found to have a specifically but faintly staining myelin sheath with short and bulging interannular segments; with Cajal's silver method for medullated nerves the axis-cylinder stained specifically; and with nuclear stains the fibres gave the appearance of peripheral nerves, with, however, a finer general structure, and more numerous and larger nuclei. The nuclear stains revealed also—what the myelin sheath and axis-cylinder stains had only slightly indicated—that the fibres in their terminal ramifications were continuous with nucleated protoplasmic tubes in which a central filament and a homogeneous outer zone could be recognised, corresponding to the axis-cylinder and myelin sheath, and, further, that these nucleated tubes could be traced frequently to terminate in fusiform, nucleated elements. Some of these were simply the sections of the nucleated tubes cut in various directions, but others could be satisfactorily and definitely proved to be individualised fusiform cells. In some of these cells could be traced a fine continuous deeply staining filament in the protoplasm on one side of the nucleus.

In the medulla and pons the most distinctive feature of the formations was an interlacing meshwork. When this was analysed it was found to consist of fusiform elements and again nucleated tubes cut in various directions. In the protoplasm of many of the cells there was present on one side of the nucleus, or projecting beyond its poles, a deeply staining filament which increased in size with the size of the cell. Further, many of these fusiform cells

were found linked together by their adjoining processes which had fused, and stages could be followed in the transition to cylindrical tubes in which the fusion had become complete and the cell-boundaries had disappeared, and protoplasmic bands or tubes had resulted. In these nucleated tubes or protoplasmic bands there was present a deeply staining central filament, winding in and out amongst the nuclei, and around it a homogeneous zone, with very numerous nuclei definitely within or projecting into the lumen of the tube. Further, it was noted that a cell-chain, thus formed, frequently divided into two, the first components of the chain lying very close, almost parallel to one another. The linked cells as they formed nucleated tubes tended to converge together to form strands, and in these strands of nucleated tubes running parallel to one another the central filament became gradually more distinct, the nuclei more flattened and peripheral and with an alternating position. Further, in such strands evidence was found of an undoubted commencing myelination, the tubes showing this all having a very definite segmental structure. Further, these parallel strands of nucleated tubes assumed a tortuous or twining character to form nodules, and during this further evolution the nuclei took a still more peripheral position and the whole tube more the character of a peripheral nerve. This was the furthest stage in the evolution of the nodules in the medulla and pons: the tubes had thus three phases in their evolution—firstly, a cellular one; secondly, that of protoplasmic bands or tubes; and thirdly, one showing the division into interannular segments and a commencing myelination.

In the cord, therefore, we have well-stained nerve fibres, apparently terminating in nucleated tubes and fusiform cells; in the medulla and pons we have fusiform cells and nucleated tubes apparently forming strands of nucleated fibres which have many of the characters of the fibres forming the more fully evolved nodules in the cord but without their specific staining; while the constituents common to the formations in both regions are the nucleated tubes and the fusiform cells. The position stated thus, it is not difficult to correlate the appearances, and the conclusion might at once be reached that in the cord we have simply a further stage in the evolution and differentiation of the fibres.

Before, however, accepting this conclusion, it is necessary to ascertain if no other explanation can be found. If we limit



ourselves to the cord and recall the fact that the nerve fibres composing the nodules could in all instances be traced to the immediate vicinity of the anterior roots, two possible explanations at once present themselves, both of which are in agreement with the old-established outgrowth theory. The one is, that the fibres represent aberrant anterior nerve roots in the sense of Orzechowski, and the other, that these are new-formed fibres of regeneration from the anterior roots, in the sense of the collateral regeneration of Nageotte in tabes.

For the first we must assume that in early foetal life a meningeal lymphangitis had caused a diversion of the growing axons, so that instead of passing into the spinal nerves a certain number of them had become side-tracked into the meninges, and thence made their way along the vessels of the cord and in the pial spaces ventrally and laterally. The fact that in the immediate neighbourhood of the anterior roots the fibres composing the strands were few in number compared to the great mass of the fibres composing the nodules, in no way tells against this view, for the importance does not depend upon the number of the axis-cylinders. It is well known that one axis-cylinder can furnish a large number of fibres by breaking up into its constituent fibrils: these, according to accessory circumstances, can twist up into whorls and form nodules when they come even from an extremely restricted number of fibres. Such neuromata would be analogous to stump-neuromata. But while it is possible in Weigert- and silver-stained preparations to explain the fibres as outgrowths from the axis-cylinders and their divisions, it is impossible to account for the nucleated tubes and fusiform cells with which the nerve fibres were continuous as outgrowths from axis-cylinders.

For the second possibility it is necessary to presuppose a degeneration, in order that a regeneration might occur from the preserved end. Such neuromata would again be analogous to stump-neuromata. Nageotte's position has been already stated, and it has also been pointed out that such an explanation cannot be accepted for the fibres forming the neuroma, for no degeneration of extra-medullary anterior root could be traced. Further, if evidence of such regeneration had been present, the explanation is still wanting of the presence of the nucleated tubes and fusiform cells with which the nerve fibres are continuous.

If, now, we turn to the medulla and pons, it is clear that

neither of the two possibilities that at first presented themselves as accounting for the cord nodules need be considered. There is no question of tracing the fibres composing even the most fully formed nodules to aberrant nerve fibres nor to a regeneration of fibres. Further, if such connections existed it would be the connection between fully differentiated fibres and immature fibres—a connection inconsistent with the explanation of the axis-cylinder as an outgrowth.

We have still to consider one further possible explanation for the cord neuromata before we have cleared the way for attempting a unification of the processes at work. This explanation is related to the multicellular structure of the peripheral nerves. In stump-neuroma, Kennedy has found that the new-formed fibres terminate in protoplasmic tubes and fusiform cells within which axis-cylinder and myelin-sheath differentiation is taking place. The new-formed fibres are in direct continuity with a nerve which preserves its connection with the centre, and, according to the cell-chain theory, the new fibres have arisen within the proliferated cells of the sheath of Schwann, and only later become continuous with the fibres of the preserved end. The possibility here also is that these are aberrant anterior nerve roots which in early foetal life have taken this aberrant course, and that some influence has caused a proliferation of the sheath of Schwann cells at the growing tips of the fibres with the formation of nucleated tubes and fusiform cells; these would therefore retain their connection with the centre just as the new fibres in the stump-neuroma. This explanation, while satisfactory for the cord, from the point of view of the cell-chain structure of the nerves, prevents the unification of the processes, for there can be no such analogous explanation of the nucleated tubes and fusiform cells in the medulla and pons. If, now, in our endeavour to correlate the changes, we pass from our observations to the conceptions which they justify, it is essential to admit that the question of the genesis of the nerve fibres is the same as the question of the genesis of the fusiform cells.

Before entering upon the consideration of the origin and nature of the fusiform cells, it is necessary to ask what collateral evidence we have that such fusiform cells can thus form nerve fibres, and we find that along three pathways research has led to the conclusion that the peripheral nerve fibre arises as a multicellular structure.

It is beyond the scope of this paper to deal with the general evidence for and against the different views relating to the development of the nerve fibre in the embryo, in regeneration, and in tumour formation, but from this evidence we wish to take such observations as throw light on our own.

(a) In embryonal development.—The works of Balfour, Dohrn, Beard, Hoffman, and others have demonstrated that, in Elasmobranchs and Selachians, cells, migrated from the embryonic medullary tube, form cell-chains, and that each nerve fibre proceeds out of any single chain by a differentiation within the protoplasm. In the higher vertebrates the conditions seem not quite so simple. Numerous recent observations, especially those of Bethe, have shown that the first evidence of nerves consists of a characteristic series of cells which form a syncytical cell-chain, and that the first fibres lie within the protoplasm of this syncytium. Kohn, too, in rabbits, has demonstrated the gradual transformation of the indifferent cells of the spinal ganglionic *anlage* into ganglion cells and nerve fibre cells, and the development of the latter into nucleated tubes, and finally into the fibres of the sensory nerves, the nuclei becoming ultimately the nuclei of the sheath of Schwann. Kohn, further, has shown that the indifferent cells of the spinal ganglionic *anlage* migrate along developing nerve paths, *e.g.*, the visceral branches of the spinal nerves, to form the sympathetic ganglionic *anlage*, that in it the indifferent cells (neurocytes of Kohn) undergo this differentiation into ganglion cells, nerve fibre cells, and chromotrope cells, and that only when the nerve fibres are formed does the connection take place with the ganglion cell.

(b) In regeneration of nerves.—Galeotti and Levi found in the new-formed tails of lizards that the first evidence of the new nerve fibres between the young muscle fibres was in the form of chains of fusiform cells linked end to end. Within the protoplasm of these cells a central granular filament—corresponding to the future axis-cylinder—developed, and, ultimately as the processes of the cells fused and the cell boundaries became lost, the central filaments became continuous. In mammals the activity of the neurilemma cells in the regeneration of nerves has never been disputed, only its result has been questioned. According to the supporters of the cell-chain theory, the proliferation of the neurilemma nuclei results in the formation of elongated cells which fuse to form

syncytical cell-chains, and in the syncytical protoplasm an axis-cylinder differentiation occurs.

Now, as the proliferation of the neurilemma nuclei indisputably results in the production of a tissue, acknowledged by centralists and peripherists alike to be a specific tissue, in the sense that it is a product of the Schwann cells and differs in structure, staining, and arrangement from ordinary connective tissue; further, as this specific tissue has, with slight unessential differences, the characters of embryonic nerve tissue: and, further, as the works of Durante, Ballance and Stewart, and Bethe have shown that the production of this tissue from proliferated cells leads to the formation of nucleated tubes and fibres with axis-cylinder and commencing myelinisation, we have distinct evidence in support of our observations of the formation of nucleated tubes and fibres from the alignment and fusion and evolution of fusiform cells.

(c) In tumour formation.—Weichselbaum, Verocay, Falk, and Schmincke have all described the formation of a neurogenous tissue composed of protoplasmic nucleated tubes or bands in the condition of embryonic, and even more fully differentiated, nerve fibres. They bring the tissue into relation to a proliferation of the cells of Schwann's sheath or the less differentiated precursors of the same—nerve fibre cells. The transition between fusiform cells and nucleated tubes was followed to the increasing development within the latter of the differentiated elements of the nerve fibres. Verocay emphasised the statement that a tissue giving the characters of immature or embryonic nerve fibres must in all cases be related to a proliferation of the sheath of Schwann cells or analogous elements.

Having received this collateral evidence that fusiform cells in development, in regeneration, and in tumour formation, may develop a neurogenous tissue composed of nerve fibres in the condition of nucleated tubes with a commencing myelination, we can now pass to consider the source and nature of the fusiform cells.

*Origin of the Cells.*—Two possibilities alone can account for their genesis. The one, that they are derived from fixed tissue elements of the nervous tissues; the other, that they are derived from abnormal cells enclosed in the tissues in early development—in other words, from embryonal residues. For the first we have no evidence. For the second it may be objected that the

terms "embryonal residues," "cell-rests," "cell-inclusions," convey no concrete conception, yet it must be admitted that some such term must be postulated, and the oncology of the cord, in the processes related to the closure of the medullary groove, allows a possible relationship between tumour-growth and disturbances of development to be more clearly perceived than in most tissues.

Obviously, then, to go further in our conclusions than our actual observations justify, we need to start with a good deal assumed. The one conclusion that appeared as a natural consequence of our observations—the multicellular structure of the fibres composing the nodules—leaves much still to be explained, and for this further explanation we must have recourse to deductions from conclusions accepted by other workers.

*Nature of the Cells.*—The development of the cells thus enclosed in the brain and spinal cord into nucleated tubes and fibres suggests that they were destined to form such structures in the ordinary course of development. For collateral evidence on this point we refer again to the development of nerve fibres in the embryo and in tumour formation.

(a) In embryonal development.—Numerous observations point to the possibility that the cells of the early medullary tube differentiate along three lines to form ganglion cells, glia cells, and nerve fibre cells—cells which migrate and form cell-chains and are therefore peripheral neuroblasts. Other observations point to the possibility that the indifferent cells of the spinal ganglionic *anlage* differentiate into ganglion cells, capsule cells, and nerve fibre cells. In each case the nerve fibres are only secondarily brought into connection with the process of the ganglion cell. The prototype of the ganglion cell (central neuroblast), glia cell, and nerve fibre cell (peripheral neuroblast), is the same mother-cell. Similarly, in the sympathetic ganglionic *anlage*, indifferent cells differentiate into ganglion cells, nerve fibre cells, and chromotrope cells.

(b) In tumour formation.—In the ganglio-neuroma, described by Falk and Verocay, the origin of the ganglion cells and nerve fibres has been traced to a common parent cell—the early indifferent cell, which has remained undeveloped. The nerve fibres found in these tumours in varying stages of development are ascribed to these cells as nerve builders and not to the ganglion cells, which were too immature—in many cases quite

a-polar—to have formed them. The importance of Kohn's researches on the development of the sympathetic is of special significance in relation to the development of ganglio-neuroma. These tumours are traced to indifferent cells which have not achieved their differentiation and evolution, and later, fulfil their destiny in an exaggerated degree. The presence of ganglion cells, nerve fibre cells, and chromotrope cells has been described by numerous writers in such tumours, especially those developing in relation to the medulla of the adrenal.

In some of the tumours of the cranial nerves described by Verocay, and in the tumours of the Gasserian ganglion and intracranial portions of the cranial nerves, described by Risel, ganglion cells, glia cells, and nerve fibre cells could be traced in all stages of transition between a common undifferentiated type to mature ganglion and glia cells and nerve fibres in different stages of development. Such observations are obviously difficult of objective proof, but their importance lies in the conception of the authors that the tumour formations must be traced to an undifferentiated cell which realised to differing degrees the differentiating possibilities present in it in the form of all three components of the nerve tissue. Verocay has suggested the term "neurinoma," for tumours of nervous nature derived from the proliferation of nerve fibre cells or their precursors. In neuro-glioma the ganglion cells and glia cells are both traced to the proliferation of an undifferentiated cell common to both forms, and in a case of neuro-glioma of the temporal lobe Schmincke traced the nucleated protoplasmic tubes present also to a common parent cell. He suggests that the production of such neuroblast chains in a tumour of the central nervous system may throw some light on the development of the central nerve fibres from cells. Glioma also are to be traced back to the development of embryonic indifferent cells, without excluding the possibility of glioma-formations in later life from already differentiated glia tissue.

Circumscribed neuromata, including amputation neuromata, are ascribed to the proliferation of the sheath of Schwann cells, which thus reassume their primitive neuroblastic function, and may develop into a-myelinated or myelinated fibres or remain at a less differentiated cellular stage.

From these observations we conclude that there is evidence for the view that undifferentiated nerve fibre cells, arisen either

from the early medullary tube or neural crest and remaining undeveloped in the tissues, may develop into nerve fibres through stages which include the fusion of the adjoining ends of linked cells, the formation of nucleated plasmodial bands or tubes, and the differentiation of these into segmented nerve fibres. Further, that peripheral neuroblasts (nerve fibre cells), from the point at which they emerge from the medullary tube, or from the point of the medullary tube which they reach from the neural crest, migrate outwards and proliferate to form a cell-chain, the proximal link of which becomes connected with the process of a central neuroblast. For the sensory cerebro-spinal nerves we would substitute the ganglionic *anlage*, derived from the neural crest, as the centre for the centripetal and centrifugal growth of the cell-chains, and for the motor cranial nerves their superficial origin instead of the line formed by the anterior spinal roots. Indifferent cells (neurocytes) would thus lie in immediate relation to the mesodermic tissue which would form the *anlage* of the connective tissue elements of the cord and brain, and in this mesodermic tissue the indifferent cells might remain undeveloped. When the invagination of the early medullary tube takes place by the entering vessels, some of these indifferent cells would be carried in with the pia and, especially in the medulla and pons, where the distribution of the nerve fibres is not so uniform as in the cord where the anterior columns run in straight lines, would be carried inwards in the walls of the vessels to numerous and widely distributed areas.

The question of the unification of the processes in the cord with those in the medulla and pons here again arises. The analogy with the growing terminal ramifications of the new nerve fibres in amputation neuroma, and in the regeneration of nerve fibres in the tail of lizards, where the new fibres terminate in a brush of fusiform cells, and the knowledge that the growing axon of a nerve is surrounded by a capsule of such cells, would lead us to assume that the terminal ramifications of the fibres, which break up into those fusiform cells, are the growing points of the fibres, and that the most fully evolved and differentiated part is the oldest part of the fibres. In the cord this part of the fibres is in the pia, in the immediate vicinity of the anterior roots; in the medulla and pons the most fully-differentiated fibres are in the more central parts of the nodule, and the winding of the fibres, as it were, has taken

place around the first-formed elements. The fibres in these positions are derived, therefore, from "rests" of undifferentiated cells of the value of peripheral neuroblasts, which have been carried in to the tissue in the walls of the ingrowing vessels, and which go on to the production of a neurogenous tissue which reaches the stage of embryonic fibres—the protoplasmic bands of Durante. The fibres in the cord have arisen from "rests" of undifferentiated cells left in the immediate vicinity of the part where in normal development the fibres are first laid down. As the spaces in the pia and pial septa give them a free path of growth, they develop in parallel and intertwining strands, and only later, when possibly they meet with some difficulty in their path, do they assume a twisted and nodular form. The precise origin of the fibres, from the point immediately peripheral to the *Ablassungzone* of the anterior nerve roots, is explained by the fact that here probably the nerve fibre cells, according to this view of their development, are first likely to be deposited.

Still assuming the peripherist view of the origin of the nerve fibre from a cell-chain, the question arises: Is it possible for such indifferent cells of the value of peripheral neuroblasts, independent of any central influence and function, to differentiate to the stage of the most fully evolved fibres in the cord? An answer to this question would be rendered easier if we could indicate the period at which these nodules have arisen. Is it that in a very early stage of development, *pari passu* with the development of the blood-vessels, indifferent cells have laid down embryonic nerve fibres? In such a case we find it easy to understand that this abnormal cell-chain might become linked on to the process of a central neuroblast just as the normal anterior roots become connected. If these, then, were such aberrant nerve roots, the incompleteness of their differentiation would be sufficiently accounted for by the sterility of their function. In such a case, however, we would have to admit that nodules with fibres having no function have persisted through life in spite of the supposed inherent weak vitality of such fibres. On the other hand, is it possible that undifferentiated potential peripheral neuroblasts have remained undeveloped at the point of their first deposition, and in later life have taken on a proliferative activity which has resulted in the formation of nerve fibres? The most fully evolved portions of such fibres have remained as parallel



strands near the point of their formation, because the free lymph space in the pia and pial vessels has allowed the progression laterally and ventrally, of the fibres.

Returning now to our question regarding the stage to which peripheral neuroblasts alone may achieve the differentiation of the nerve fibre, we must refer to evidence obtained from the regeneration of nerves and from tumour formation.

(a) *In Regeneration*.—It has frequently been pointed out that a neurogenous tissue, with many of the characters of embryonic nerve tissue, arises in the distal end of a severed nerve as a result of the activity of the cells of Schwann's sheath. Durante, Ballance and Stewart, and Bethe have shown that in the specific tissue a differentiation to axis-cylinder and incomplete myelination may take place even when the distal end is not united to the central end. For a complete differentiation of axial fibrils and myelin, all admit that the influence of the central neuroblast is essential.

(b) *In Tumour Formation*.—The generalisation that the genesis of nerve fibres in regeneration recapitulates the stages of its first development has necessarily its limitations, and one of these may be the modifications imposed on the cells derived from the proliferation of the sheath of Schwann nuclei. It is not necessary, then, to deny the possibility that in tumour formation peripheral neuroblasts can form completely differentiated fibres, for here we are dealing with cells left undeveloped in the tissue. The evidence from the cases of ganglio-neuroma already mentioned leads us to suppose that the nerve fibre cells or their precursors differentiate to the development of nerve fibres which show many of the characters of fully formed nerves, stopping short again of the stage of complete axial fibril and myelin differentiation.

From this evidence, therefore, we gather that it is quite conceivable that the fusiform cells in our preparations have evolved to the formation of nucleated tubes in the condition of the protoplasmic bands of Durante in the medulla and pons, and in the cord to a yet completer stage of differentiation. Lenhossek, a convinced centralist, states in his latest paper that he cannot deny the evidence that the sheath of Schwann cells (lemnoblats) may in pathological conditions, in virtue of their origin from the neural crest, produce true nerve fibres. To Lenhossek the sheath of Schwann cells are the glia elements of the peripheral nervous

system, but he thinks that, in the uncertainty of our conception of the actual manner of cell differentiation, it is possible that a mother cell which should have differentiated along one line may in pathological conditions differentiate along another which had the same histogenesis.

This attempt at a possible interpretation and correlation of our observations is not regarded as in any sense a logical proof. It is not contended that the facts prove the truth of this conception, but it is maintained that this view, though based only on deductions, gives clearness to an otherwise quite unintelligible process.

It is convenient at this stage to consider one or two criticisms of the peripherist standpoint with special references to appearances in our preparations.

The necessity of the influence of the central ganglion cell to complete the differentiation of the new nerve fibre, arisen from the proliferation of the sheath of Schwann cells, in regeneration has seemed an unassailable argument in favour of the centralists' view. To this criticism the reply has been made that if it is true that every cell differentiates in view of a function, it is necessary to remember that it is the functioning which determines and perfects the cell differentiation. The nerve paths in the embryo remain as embryonic nerves till the function of the tract is called into play; influences which accelerate or retard the period at which nerve fibres are brought into functional activity have also an effect in determining the date of complete axial fibril and myelin differentiation. Margulies has pointed out that in the newly-born kitten, if the eyelids on one side are carefully opened, the optic nerve on that side myelinates before that of the opposite side excluded from the light, and numerous other instances might be given where the completion of differentiation is related to the completion of function. The fibres in the distal end of a non-united nerve remain for a very considerable time as embryonic nerve fibres, but when secondary suture is carried out they very rapidly effect a complete differentiation—in a period of time in which it would have been impossible for axis-cylinders to grow out from the central to the distal end.

The differentiation proceeds, therefore, *pari passu* with the functioning which is its determining cause. Ballance and Stewart think that some stimulus, afforded by the conducting of impulses, is necessary in order to admit of the full development of the nerve

fibres, and Graham-Kerr relates the differentiation of the neuro-fibrils to the repeated passage of impulses along them. To attain its perfect structure, therefore, a nerve must be brought into relation to its functional *Inanspruchnahme*. Bethe, at present the most prominent supporter of the peripherist view, claims that it is not necessary to have complete differentiation to have an auto-genous regeneration. Regeneration in the distal end of a non-united nerve is not due to the ingrowing of axis-cylinders from the central end, but the autogenous regeneration of the sheath of Schwann cells forms a neurogenous tissue to which complete differentiation comes when the nerve is brought into its *Funktionskreis*. This neurogenous tissue is the maximum of what could be expected for the regenerative powers inherent in cells which have been derived from highly differentiated elements, while the first development is carried out in definite correlation with tissues all in the act of development. Bethe in some of his interpretations may have overstepped the mark, and some of his experiments may not be unequivocal, yet his basal contention, maintained after long research and in face of the severest criticism, that the new fibres arise within the proliferated cells of the sheath of Schwann and not as outgrowths of the central axis-cylinder, is supported by the results of the most recent embryological researches, by a very large number of workers on the regeneration of nerves, and by numerous observations on the genesis of nerve fibres in tumours.

A further criticism has been raised by Cajal and Perroncito in regard to the division of the fibres and the leashes of fine fibrils found in the old neurilemma sheaths of a regenerated nerve. Those writers think that it is impossible to explain such findings except by the dissociation of the old axis-cylinder into its constituent fibrils and the terminal or collateral branching-off of these primitive fibrils. Ballance and Stewart have noted that the proliferated sheath of Schwann cells divide in an obliquely longitudinal plane so that the resulting daughter cells somewhat overlap one another, and by successive divisions closely-set longitudinal columns or chains are formed. The first threads of axis-cylinders appear in close relation to the elongated nuclei, and each cell is potentially capable of forming a segment of a complete nerve fibre, so that within an old neurilemma sheath may be found parallel axis-cylinder filaments which ultimately join with the poles of adjoining filaments to form a leash of fibrils. Francini

and Durante have observed that in the proliferation of the sheath of Schwann nuclei the division may take place in two directions, *i.e.*, transversely to the longitudinal axis of the cell, and parallel to it. In our preparations we have drawn attention to the evidence of the longitudinal cleavage of nucleus and cell which results in the formation of the first links of two new chains, which thus give the appearance of a dichotomous division and have suggested that a further elongation of the cell-chain takes place by transverse cleavage of nucleus and cell.

Again, regarding the chemiotropic influence attributed by the centralists to the sheath of Schwann cells, it is not easy to understand what attracting or directing or orienting influence these cell-chains could have in the development of a nodule whose fibres cross each other in such varying directions. There is much to indicate that the nerve fibres take the path of least resistance, and are guided by the more fixed structures in the line of their general growth.

We have noted these criticisms of the peripherist view in relation to points bearing on our preparations, and we close with a brief statement of three criticisms of the outgrowth theory. The supporters of the cell-chain structure of the peripheral nerves, firstly, find it difficult to conceive of a prolongation of a cell so disproportionate to the element which gave it birth; secondly, believe it impossible that a differentiated substance like the axis-cylinder can bud, as such a procedure is against the *data* of general cytology which attributes to differentiated substances only a functional rôle; and finally they attribute the absence of any satisfactory demonstration of regeneration of fibres in the central nervous system to the absence of the activity of the neurilemma cells.

*Conclusion.*—Francini states that in the histological study of a neuroma an intuition came to him of the constitution of the peripheral nerves. We think it right to emphasise that we began this investigation with no preconceptions in favour of the multicellular structure of the peripheral nerve. We accepted the classical teaching of His and Cajal that the axis-cylinder is an outgrowth from the central cell and that its free end terminates in an incremental cone of growth. A prolonged study of our preparations and the further light shed upon them by research into the

literature of the genesis of the nerve fibres in the embryo, in regeneration, and in tumour formation, led us, however, to the following conclusions: that fusiform nucleated cells linked on to one another have formed embryonic nerve fibres; that in these nucleated fibres, which show very distinctly in their segmental structure their origin from individual cells, have differentiated to a greater (in the cord) or lesser (in the medulla oblongata and pons) degree the specific nervous elements—axis-cylinder and myelin sheath; and that function is essential to the complete differentiation of the nerve fibre. As the genesis of these cells cannot be traced to any of the specific elements of the tissue, we suggest that the fusiform nucleated cells which build up the nucleated tubes and nerve fibres are indifferent cells of the value of peripheral neuroblasts—according to the cell-chain conception—which have wandered into the mesodermic tissue forming the *anlage* of the vessels and of the connective-tissue constituents of the cord, and that, later, they develop their latent activity.

The multiplicity of the nodules favours this mode of origin and the presence of several anomalies—the malformation in the pons, the glia islets in the spinal pia, and the heterotopia of ganglion cells—lends countenance to the correctness of the assumption that these, together with the neuromata, must be regarded as developmental anomalies.

*Our study, then, is a confirmation, from the aspect of a pathological new formation, of the multicellular structure of the peripheral nerve fibre.*

The supporters of this view claim that the neurone conception is thus placed in its true light without necessarily destroying it: “Elle réduit la doctrine des neurones à sa véritable valeur sans l'ébranler.” The neurone would therefore no longer be looked upon as a structural unit but its trophic autonomy is retained. Two of our predecessors in the study of this difficult and complex problem have taken as the motto of their work, “To travel hopefully is a better thing than to arrive,” and, in concluding, as we recognise the conscientiousness of the research which has led equally able workers to take views that seem so fundamentally opposed to one another; we must admit that there are no sufficient grounds for stating that the old neurone theory has had its day, nor, on the other hand, that the cell-chain theory has no foundation.

*(To be continued.)*

**THE DIFFERENTIATION OF CELLS IN THE  
CEREBRO-SPINAL FLUID BY ALZHEIMER'S  
METHOD.**

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(With Plates 17 and 18.)

IN 1907 Alzheimer (1) of Munich perfected a method for the differential cell estimation of the cerebro-spinal fluid, which, as far as we know, has not been employed in this country. Alzheimer was led to introduce this method because he realised that by none of the quantitative methods could one obtain a really accurate cell differentiation, and because he hoped that by means of a good cell differentiation one might obtain help in the correct diagnosis of certain forms of obscure mental and nervous disease.

The technique is not difficult. It consists in centrifuging 3 or 4 c.c. of the cerebro-spinal fluid with double the quantity of 96 per cent. alcohol for from one half to one hour, depending on the speed of the centrifuge, and by this means the proteid is coagulated into a hardened plug. It is then still further dehydrated and hardened by means of pouring on absolute alcohol, then equal quantities of absolute alcohol and ether, and finally ether, each for a variable number of hours, depending upon the thickness of the plug. The plug is next loosened from the side of the tube by a fine flattened platinum needle, embedded in celloidin and cut in sections of 15 m. in thickness. The cut sections may be stained by Pappenheim's pyronin-methyl green, or with Unna's polychrome methylene-blue. The procedure and details of the staining have already been fully described by Cotton and Ayer (2).

We have had to modify the above technique, owing to

the fact that we did not have a celloidin microtome. Dr Ford Robertson suggested to us that equally good results might be obtained by using dextrine as a medium for freezing the celloidin block, and cutting the sections with an ordinary freezing microtome.

Our procedure, therefore, was as follows: The plug of cerebrospinal fluid was prepared as above and embedded in 8 per cent. celloidin. When dry the block was immersed in dextrine made up according to the following formula: Dissolve dextrine 1 part in 2 parts of boiling water, filter through white cotton wool, add 1 per cent. of carbolic acid as a preservative. The block was left in the dextrine until the following day or until required; this prevents the celloidin from becoming too hard. The celloidin dextrine block was then placed on the microtome surrounded by more dextrine, and frozen by means of an ether spray. The cut sections were immediately placed in warm water to wash out the dextrine, and then mounted on slides. The celloidin was next dissolved out, first by methyl alcohol, then by absolute alcohol, lastly by 75 per cent. alcohol, and stained by pyronin-methyl green. By this method it is impossible to obtain sections absolutely uniform in thickness, and care must be taken to avoid cutting too thin sections, as we have found that the stain was exceeding easily washed out from these, and consequently the cell differentiation was poor.

Rehm (3) working in the Munich laboratory over an extensive and varied material has demonstrated very clearly the value of this method. Some of his most important findings may be briefly quoted. In general paralysis he found that, in addition to an increase in the quantitative cell count, the cell types showed more variation than in any other form of nervous or mental disease. He was particularly impressed by the constant appearance of plasma cells, gitter cells, macrophages, and fibroblasts. He went so far as to consider gitter cells almost typical for general paralysis, although he admits that these cells are found in some cases of brain syphilis, and of tuberculous and purulent meningitis. On the other hand, he states that he has never found either plasma cells or gitter cells in cases of *tabes dorsalis*. This observation, if correct, would be an important point in the differential diagnosis between general paralysis and *tabes dorsalis*.

It is interesting to observe that in tuberculous meningitis he has demonstrated the occurrence of a cell type resembling the plasma cells described by Nissl and Alzheimer, but yet has hesitated to call such cell types plasma cells.

Cotton and Ayer point out the practical value of Alzheimer's method of cell differentiation for the differential diagnosis in psychiatry. They have stated that in general paralysis the cell picture is different from that found in any other form of insanity. They consider an excess of lymphocytes, plasma cells, and perhaps macrophages (phagocytic cells) are the most characteristic features of general paralysis. They make no statement in regard to the importance of gitter cells.

Hough (4) has found plasma cells in the cerebro-spinal fluid in general paralysis, and in brain syphilis, but does not consider them in any way pathognomonic, as he has found them together with körnchen cells in the cerebro-spinal fluid in cases of acute anterior poliomyelitis, epidemic form (5).

Our own material has been mainly limited to cases in the Royal Edinburgh Asylum, under the charge of Dr George M. Robertson, but through the kindness of Dr J. S. Fowler, and Dr Edwin Bramwell, we obtained spinal fluids from three cases of tuberculous meningitis, and one case of tabes dorsalis.

Our cases were as follows:—

General paralysis	-	-	-	26
Tabes dorsalis	-	-	-	3
Cerebral syphilis	-	-	-	4
Arterio-sclerotic brain disease	-	-	-	2
Imbecility	-	-	-	5
Alcoholic psychosis	-	-	-	2
Dementia præcox	-	-	-	11
Tuberculous meningitis	-	-	-	3

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56

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Our routine examination of this material consisted, in cases where the quantitative cell count was increased, of a differential count of from 400 to 500 cells, and in those cases where the quantitative cell count was negative, from 100 to 200 cells were



counted. The quantitative cell count was performed by the Fuchs-Rosenthal counting chamber method.

We have differentiated the following cell types:—

*Lymphocytes.*—These cells form the largest percentage of cells found in the normal spinal fluid. A lymphocyte is a small round cell with a deeply staining nucleus which occupies nearly the whole cell. The nucleus is usually fairly homogeneous, but occasionally the chromophilic granules are arranged round the periphery in a “clock-face” manner, similar to the arrangement in plasma cells. The protoplasm is seen as a thin pink-stained rim round the nucleus. Rehm and Cotton have described an atypical form showing a larger amount of protoplasm which may have a tailed appearance.

*Mononuclear Cells.*—This type of cell formed a fair percentage of every spinal fluid examined, and therefore must be considered a normal constituent. It is usually a large cell, and is characterised by a nucleus eccentrically placed, varying considerably in shape and size, and staining a lighter blue than the lymphocyte. This nucleus is most commonly kidney-shaped, but round forms are seen and occasionally twisted forms. The protoplasm is large in amount and stains a pale pink.

*Macrophages or Phagocytic Cells.*—These cells were present in small numbers in practically all the fluids examined. The type of cell which we have termed a macrophage corresponded closely to the mononuclear cells, and have simply been differentiated on account of the capacity they possess of ingesting other cells. Owing to the frequency of their occurrence, we must regard them as a type of cell which may be found in normal fluid.

*Polymorphonuclear Cells.*—This type of cell is one which may be present in small numbers in normal fluid. The nucleus is stained a dark blue, and the protoplasm may appear as a faint grey-pink, but is usually unstained. In our experience, in general paralysis, these cells have varied in number from 0·3 to 16 per cent., and the case which showed this maximum count terminated fatally in a short time. Hough considers that polymorphonuclear cells are most numerous in rapidly advancing cases, but has demonstrated that they are usually more numerous in cases of cerebral syphilis than in cases of general paralysis. After

convulsive seizures in either of these affections they tend to be somewhat increased.

*Endothelial Cells.*—We have found these cells present particularly in cases of general paralysis, but we have also seen them in fluids which were negative in every respect.

The nucleus is large, oval or roundish in shape, pale blue in colour, contains deeply-stained granules and a nucleolus, which is usually stained a bright pink.

The protoplasm is small in amount, stained pink, and is sometimes not apparent.

*Plasma Cells.*—Hitherto these cells have been looked upon as almost pathognomonic for general paralysis. Undoubtedly they constantly occur in general paralysis, probably in greater numbers than in most other affections, but we have found them present both in tabes dorsalis and tuberculous meningitis.

Rehm and Hough also demonstrated their occurrence in cases of cerebral syphilis, and therefore we cannot hold them typical for any one condition; we have never found them present in normal fluid. The typical plasma cell is a larger cell than a lymphocyte, varies considerably in shape, and often presents a tailed appearance. The protoplasm is abundant, stains deeply pink with the pyronin stain, and has a coarsely granular appearance. Frequently there is a clear area directly round the nucleus. The nucleus is eccentrically placed, round in shape, and has the very characteristic "clock face" arrangement of its chromatic granules.

Turner (6) differentiates two varieties of plasma cells, one of which he considers is derived from endothelial cells, and the other from lymphocytes. The origin of these cells is, however, still in doubt.

*Transitional Cells.*—Any cells which we have been unable to define clearly as lymphocytes, plasma, or endothelial cells, have been included in this group.

*Gitter or Lattice Cells.*—This type of cell has never been found by us in normal fluid. We have found these cells in various stages of development in general paralysis and in tuberculous meningitis, and have considered the type of cell which Cotton and Hough designate as a *Körnchenzell*, as an early stage of the gitter cell.

These gitter cells are the largest forms met with, and show the

characteristic vacuolation and lattice-work appearance of their protoplasm. Some were phagocytic. The nucleus was pale and irregular, and commonly situated at the periphery.

*Fibroblasts.*—These cells occurred in a very small percentage of our cases, and were most frequent in cases of general paralysis.

They have usually an elongated, spindle-shaped nucleus stained blue, slightly granular, and commonly show faintly stained protoplasm at each end, which may, however, be absent.

We shall now briefly discuss the groups of cases examined.

*General Paralysis.*—From quantitative methods it is well known that an increased cell count is practically always obtained in this group of cases. The qualitative examination has confirmed the large cell count, and in addition has demonstrated the multiplicity of the cell types; this has been particularly striking in cases with a small total cell count. In all twenty-six cases the small lymphocyte was the predominating cell, averaging between 52 and 84 per cent. Macrophages or phagocytic cells were present in small numbers in all but one case. Polymorphonuclear leucocytes were present in all cases, and in case 25 reached the large number of 16 per cent., although the spinal fluid was free from blood.

Plasma cells of the type described by Nissl and Alzheimer were also present in every case, and varied between 1.5 and 16 per cent. The case (case 2) which showed the large plasma cell count of 16 per cent. was one in the early stage of the disease and of a florid type. Gitter cells were found in small numbers in all but three cases.

As the result of our observations we would be inclined to agree with Rehm in considering plasma and gitter cells as almost characteristic for general paralysis. It is true that in tuberculous meningitis we have found both plasma and gitter cells in the cerebro-spinal fluid, and Hough found them in the cerebro-spinal fluid in cases of acute anterior poliomyelitis, but these diseases need hardly be considered in connection with the differential diagnosis of general paralysis.

*Tabes Dorsalis.*—One of the cases belonging to this group has shown no mental symptoms, but the other two presented well-marked physical signs of tabes associated with mental symptoms non-paralytic in nature. In addition to the usual cell types we have found plasma cells present in two out of three cases. This

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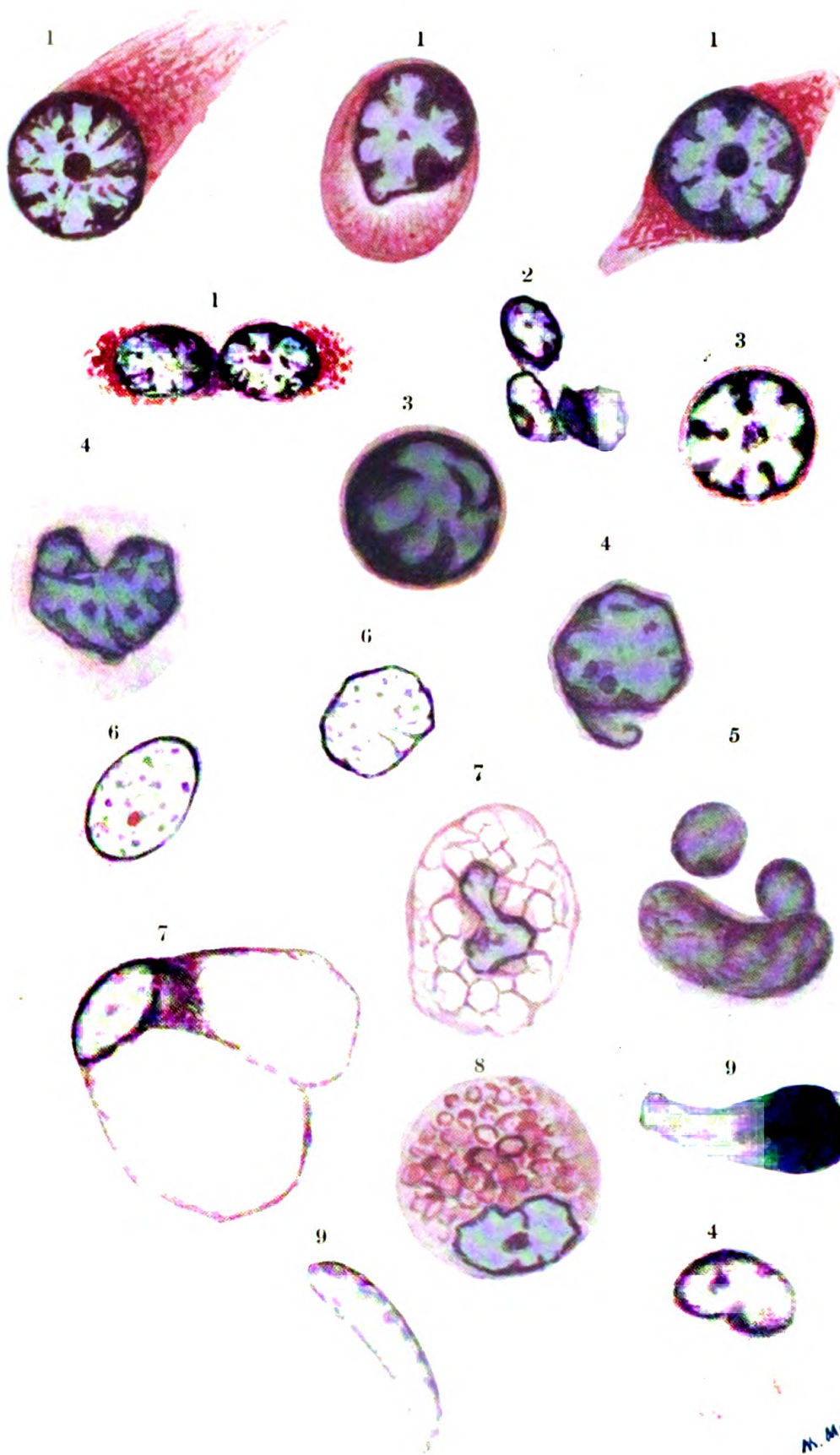
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finding negatives the differential point between general paralysis and *tabes dorsalis* formulated by Rehm, as he stated that he had never found plasma cells in cases of *tabes dorsalis*. We recognise that our material is scanty and not sufficient to enable us to make any dogmatic assertion, yet we would emphasise the fact that, so far, we have been unable to find gitter cells in *tabes dorsalis*, as opposed to general paralysis.

Case 28 was particularly interesting to us, owing to the fact that here we had a case presenting a normal cell count, and yet showed 2 per cent. of plasma cells in the qualitative cell count.

Case 29, which showed no plasma cells, is one non-progressive in character, several years in duration, gives a negative blood serum Wassermann reaction, and a negative cerebro-spinal fluid cytologically, chemically, and serologically.

*Cerebral Syphilis*.—The four cases of cerebral syphilis which we have examined are old-standing and quiescent cases, and all gave a negative quantitative cell count.

The qualitative cell picture corresponded to that obtained with a negative fluid. We did not observe either plasma or gitter cells. It is well to remember, however, that Rehm and Hough have each found both plasma and gitter cells in some cases of cerebral syphilis. Their findings thus render plasma and gitter cells valueless as differential factors in the diagnosis between general paralysis and cerebral syphilis, unless their percentage is very high, when the diagnosis of general paralysis would be more indicated than one of cerebral syphilis.

*Imbecility*.—The five cases belonging to this group showed no outstanding features, even although one of them was a congenital syphilitic, and gave a positive Wassermann reaction with his blood serum.

*Tuberculous Meningitis*.—The three cases comprising this group have given us cell types absolutely similar to those obtained in general paralysis, as, in addition to the usual cells, we have found both plasma and gitter cells. This observation again confirms that of Rehm, who, as has been stated, was averse to classify certain cells as plasma cells, because he found them difficult to differentiate from certain forms of tailed lymphocytes.

As far as we are concerned, the cells which we have termed plasma cells are identical with that type of cell found in cases of general paralysis which are known as plasma cells.

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No.	Name.	Diagnosis.	Character of Fluid.	Cell Count.	Lymphocytes.
				Per c.mm.	Per cent.
1	J. A.	General Paral.	Clear	7	73
2	M. M.	" "	Sl. Blood	71	55
3	F. G. P.	" "	Clear	109	74
4	R. A. G.	" "	Sl. Blood	9	73
5	J. M.	" "	Clear	16	63
6	A. F.	" "	"	87	74
7	J. M.	" "	"	127	76
8	J. L.	" "	"	42	84
9	A. H.	" "	"	40	83
10	J. D.	" "	"	25	78
11	M. F.	" "	"	15	75
12	R. S.	" "	"	16	73
13	T. S.	" "	"	15	78
14	F. M.	" "	"	84	79
15	W. R.	" "	"	40	73
16	A. M'D.	" "	"	103	79
17	W. S.	" "	Sl. Blood	71	68
18	J. S.	" "	Clear	6	63
19	B. S.	" "	"	28	70
20	W. W.	" "	"	90	76
21	M. A.	" "	"	48	73
22	E. D.	" "	"	10	75
23	R. R.	" "	"	27	73
24	A. R.	" "	"	27	52
25	A. D.	" "	"	110	69
26	T. B. B.	" "	"	10	69
27	...	Tabes Dorsal.	"	...	63
28	D. W.	" "	"	5	76
29	J. K.	" "	Sl. Blood	1	63
30	L. C.	Cerebral Syph.	Clear	3.2	61
31	J. P.	" "	Sl. Blood	4	74
32	W. S.	" "	Clear	2.2	61
33	J. G.	" "	"	1	60
34	R. M.	Arterio Scler.	"	1.5	72
35	A. R.	" "	"	1	61
36	C. F.	Imbecility	"	0.66	70
37	G. T.	"	"	0.5	63
38	G. D.	"	"	1.3	65
39	J. W.	"	"	8	67
40	J. J.	"	"	0.8	76
41	M. O.	Alcoh. Psych.	"	0.2	68
42	J. M.	" "	"	1.6	62
43	J. R.	Dement. Præc.	"	2.3	59
44	P. W.	" "	"	9	70
45	W. P.	" "	"	2	62
46	N. R.	" "	"	0.6	71
47	J. M.	" "	"	0.6	64
48	J. G.	" "	"	0.8	76
49	J. G.	" "	"	0.6	74
50	H. P.	" "	"	1.6	75
51	W. C.	" "	"	1.6	78
52	W. P.	" "	"	0.6	73
53	W. H.	" "	"	0.6	68
54	...	Tubercul. Menin.	Turbid	...	68
55	...	" "	"	...	68
56	...	" "	"	...	58

# CELLS IN THE CEREBRO-SPINAL FLUID

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Lymphocytes	Mono-nuclears.	Macro-phages.	Polymorphs.	Endothelial.	Plasma.	Transitional.	Gitter.	Fibroblasts.
Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
18	2	2	1	2.5	...	0.5	0.25	
16	1	8	1	16	...	0.6	...	
11	2	2	...	8.6	1	1	...	
14	2	5	3	4	...	0.6	0.4	
25	3	2.5	1	2.5	...	1.5	...	
11	0.4	4	0.8	7	0.8	0.6	...	
10	2	5	1	3.5	...	0.3	...	
5	2	2	1.2	5.5	...	0.2	0.2	
8	1.3	0.3	...	6.5	...	...	...	
9	0.8	3	1.8	4.2	...	0.4	...	
9	2	1.8	0.6	9.6	0.2	...	0.2	
7	2	7	1.6	6.4	...	0.8	0.4	
16	...	0.6	...	4	...	0.6	...	
8	0.6	1.2	1	9	...	0.4	...	
10	2	3	2	6	...	1.3	...	
15	1.6	1	...	2.3	...	0.3	...	
14	0.8	10	1.4	5	...	0.2	...	
32	2	0.5	...	1.5	...	...	...	
15	1.6	6.8	...	4.4	...	0.8	...	
15	2	2	0.2	3.2	...	0.4	...	
14	0.3	2.3	0.3	9	...	0.3	...	
12	0.4	1.2	0.6	9.4	...	0.2	...	
14	2	1	1.6	4.6	1.2	1.2	0.2	
37	3.6	1.3	1	3.3	...	0.6	0.3	
8	0.2	16	0.2	4.4	...	0.4	...	
18	1	1	...	9.3	...	1.6	0.6	
30	...	3	...	2.5	1.5	...	...	
13	2.7	2.7	0.7	2	2.5	...	0.25	
24	5	6	...	...	2	...	...	
33	3	3	...	...	...	...	...	
19	2	5	...	...	...	...	...	
36	...	...	2	...	...	...	...	
33	1	2	4	...	...	...	...	
28	...	...	...	...	...	...	...	
37	2	...	...	...	...	...	...	
24	4	1	1	...	...	...	...	
31	3	1	2	...	...	...	...	
30	4	1	...	...	...	...	...	
27	3.5	...	2	...	...	...	...	
22	2	...	...	...	...	...	...	
31	1	...	...	...	...	...	...	
36	...	...	...	...	...	...	...	
37	3	1	...	...	...	...	...	
24	4	1	1	...	...	...	...	
37	...	1	...	...	...	...	...	
34	1	4	...	...	...	...	...	
23	2	1	...	...	...	...	...	
23	1	...	...	...	...	...	...	
21	3	1	1	...	...	...	...	
22	1	...	2	...	...	...	...	
19	2	...	1	...	...	...	...	
25	2	...	...	...	...	...	...	
23	3	1	...	...	...	...	...	
23	2	2.3	2	1.5	1	0.2	...	
22	1.5	5	0.75	2	...	0.5	...	
15	1.8	18	...	5.8	...	0.4	...	



It has always been stated that in cases of tuberculous meningitis, the lymphocyte is the markedly predominating cell. That statement is true, but by this more exact method of cell enumeration we have found a large percentage of mononuclears present, and in addition, in one case (case 56) actually 18 per cent. polymorphonuclear leucocytes were present in a spinal fluid free from blood. This case progressed extremely rapidly to a fatal termination.

*Negative Cases.*—Included among those are seven cases of arterio-sclerotic brain disease, two cases of alcoholic psychosis, and eleven cases of dementia præcox. All these cases were negative, both in the quantitative and qualitative cell estimation, and corresponded to our standard of normal.

#### SUMMARY.

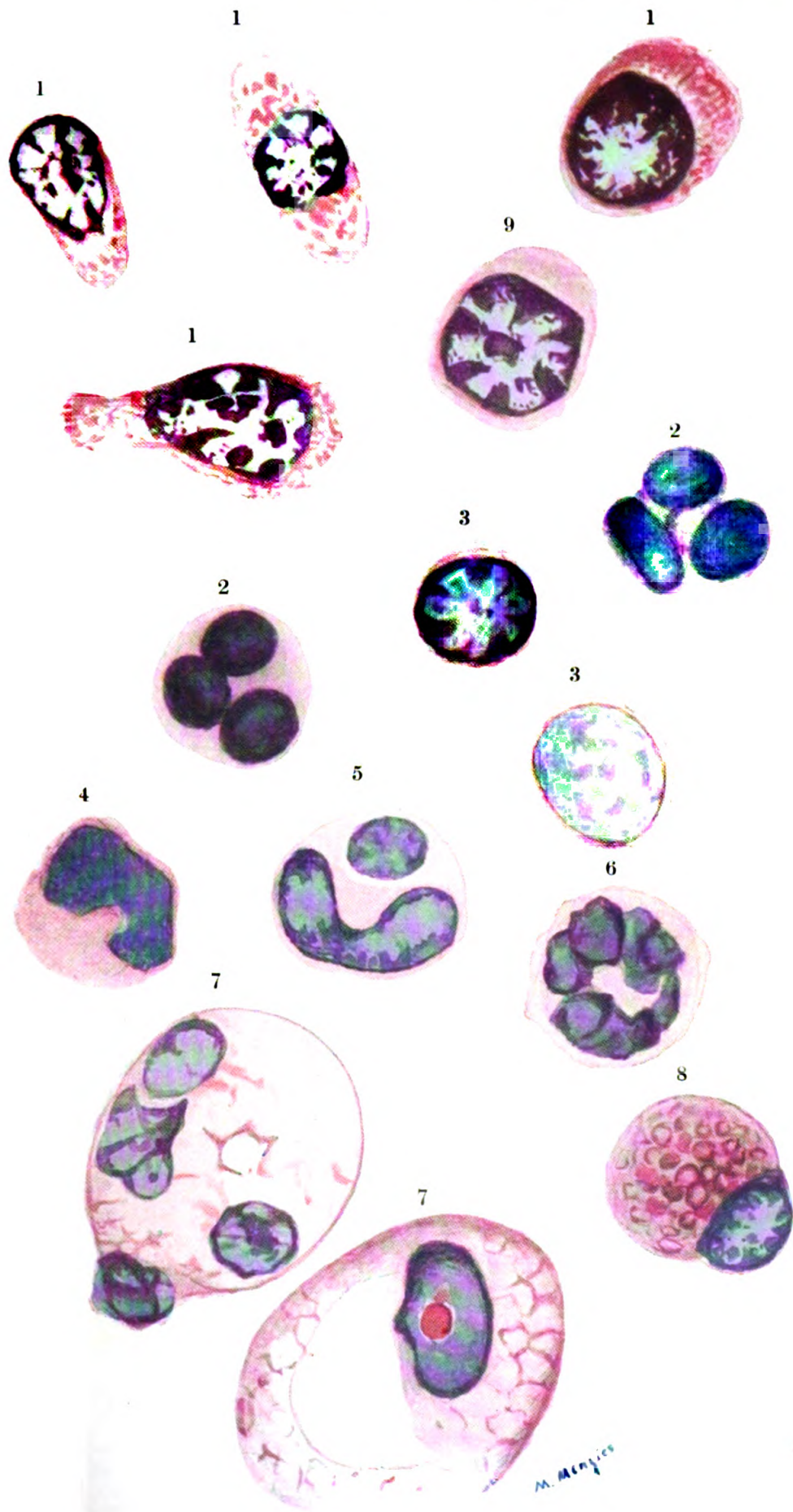
1. The qualitative method of cell examination as devised by Alzheimer affords facilities for an accurate differentiation of the various types of cells contained in the cerebro-spinal fluid, and promises to be of considerable assistance in the diagnosis of various nervous and mental diseases.

2. In general paralysis a greater variation in cell types was seen than in any other psychosis, but a similar picture to that of general paralysis was obtained in cases of tuberculous meningitis; such cases, however, do not complicate the diagnosis of general paralysis.

3. Plasma cells and gitter cells seem to be characteristic features of general paralysis, and were found to be constantly present; in cerebral syphilis these two types of cells have been found by other observers, but apparently not in such large numbers or so constantly as in general paralysis.

4. We cannot corroborate the assertion of Rehm that plasma cells do not occur in tabes dorsalis, as we have demonstrated them in two out of three cases; on the other hand, we did not find gitter cells in tabes dorsalis, as opposed to general paralysis, and this may be a point of differential value.

5. Our material is too scanty to warrant us arriving at any definite conclusions, but further study along this line would appear to offer a wide field for investigation.





In conclusion we thank Dr G. M. Robertson, Physician Superintendent of the Royal Edinburgh Asylum, for permission to publish the result of our investigation; and we also thank Dr J. S. Fowler and Dr Edwin Bramwell for their kindness in supplying us with specimens of cerebro-spinal fluid.

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#### EXPLANATION OF PLATE XVII.

This plate shows the different types of cell in general paralysis:—

- |                            |  |
|----------------------------|--|
| 1. Plasma cells.           | 5. Macrophage.                         |
| 2. Polymorphonuclear cell. | 6. Endothelial cells.                  |
| 3. Lymphocytes.            | 7. Gitter cells.                       |
| 4. Mononuclear cells.      | 8. Developmental stage of gitter cell. |
| 9. Fibroblasts.            |  |

#### EXPLANATION OF PLATE XVIII.

This plate shows the different types of cells in tuberculous meningitis:—

- |                             |  |
|-----------------------------|--|
| 1. Plasma cells.            | 6. Dividing cell showing rosette arrangement of nucleus. |
| 2. Polymorphonuclear cells. | 7. Gitter cells, one of which is phagocytic.             |
| 3. Lymphocytes.             | 8. Developmental stage of gitter cell.                   |
| 4. Mononuclear cell.        | 9. Transitional cell.                                    |
| 5. Macrophage.              |  |

## Abstracts

### ANATOMY.

**ANATOMICAL STUDY OF THE PINEAL GLAND IN MAN.** (Studio (146) *anatomico della glandola pineale umana.*) F. POLVANI, *Rassegna di Studi Psichiat.*, Vol. iii., F. 1, Gennaio-Febbraio 1913, p. 3.

A PRELIMINARY note of a paper in which the author considers that the pineal gland of the higher mammals is homologous to the diverticulum epiphysarium of the fish. He also records the presence of groups of parenchymatous cells which he proposes to call the "parapineal nuclei." These cells have the character of secretory cells, and he thinks that their function is to control the secretion of the testicles and ovaries. A. NINIAN BRUCE.

**BIOCYTONEUROLOGY BY THE AID OF THE ULTRAMICROSCOPE.** (147) (*Essai de biocytoneurologie au moyen de l'ultramicroscope.*) MARINESCO, *Nouv. Icon. de la Salpêtr.*, May-June 1912, p. 193.

THE living nerve cell can be studied either with the ultramicroscope or by observing its reaction in a living state to various colouring matters. It is known to be a colloidal complexus whose structure bears a definite relation to the organisation of the colloids within the cell. Colloidal solutions are not of the nature of a homogeneous mixture, but contain in suspension particles much smaller than those in ordinary suspensions, but larger than molecules. With the ultramicroscope these colloidal particles can be readily seen. Particles can be seen without difficulty whose diameter is as low as  $0.003 \mu$ . Certain colloidal solutions contain particles still smaller, incapable of resolution with the ultramicroscope. As a rule a colloid is a heterogeneous solution, i.e., it contains particles of different homogeneous systems. They can be seen to be in constant movement, each particle moving independently of its neighbours, like specks of dust in a ray of sunlight. Colloids are not displaced by the passage of an electric current unless they contain electrolyte ions.

Now the cytoplasm of the nerve cells in the root and sympathetic ganglia of mammals and of other animals lower in the scale contains great numbers of colloidal granules, whose volume and density vary with the age and species. In living cells no structure in the least resembling the tigroid substance of Nissl is to be found. If the granules are large the general tint of the cell is bluish yellow or yellow: if small, grey or grey-blue. In man the larger the actual dimensions of the cell, the smaller its granules, as a rule.

Colloidal granules can easily be detected in the axone. The cytoplasm of the living cell has a good deal of elasticity: under slight compression the cell is for the moment deformed, but will return to its normal state when the compression is removed. If the compression continues the cell has a marked tendency to become lobulated. Brownian movement is very rare in living nerve cells: it may be assumed, therefore, that their colloidal content is viscous, and of the nature of a jelly rather than of a solution. Any reagent, such as distilled water, which reduces the viscosity of the cytoplasm, will cause brownian movements of the particles to appear.

The application of any coagulant, such as acids, metallic salts, &c., to the living cell will at once precipitate the colloidal contents, in a form that very closely resembles the familiar Nissl bodies. The same result can be obtained by adding a drop of a watery solution of methylene blue. Eosine and various other colorants do not give rise to a Nissl formation.

A neurofibrillar structure cannot be detected in the living cell by the ultramicroscope, but it is quite possible that the neurofibrillæ are constituted by a viscous homogeneous transparent jelly belonging to the class of stable colloids, which are precipitated with difficulty.

S. A. K. WILSON.

## PSYCHOLOGY.

**ON THE PSYCHOLOGY OF JUVENILE CRIMINALS.** (Zur (148) *Psychologie jugendlicher Krimineller.*) G. MAJOR, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, Juni 1912, *Ergänzungsheft*.

A SOMEWHAT diffuse article with brief reports of several cases. The author attributes the increase of juvenile delinquency in Germany to the commercial development of the country after the war of 1870.

C. MACFIE CAMPBELL.

## PATHOLOGY.

**INVESTIGATIONS ON SENILE PLAQUES.** (*Untersuchungen über (149) die "senilen Plaques."*) G. MARINESCO and J. MINEA, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, Juni 1912, *Ergänzungsheft*.

THE authors report the results of the investigation of the cerebral cortex in two cases, one aged 54, the other 107. They conclude that there are three phases in the development of the senile plaques. The first phase consists in the deposit of a colloid substance from the nutritive plasma of the nervous tissue. This material is deposited at first in small quantities, in thin threads

and rods. At a certain stage there is a reaction of the nerve fibres in the vicinity with swelling and the formation of a central body. The changes in the nerve fibre are compared by the authors to the changes in the central end of the nerve in the first days after its division, but the attempt at regeneration proceeds no further, probably due to the absence of a positive chemiotactic secretion. The third phase consists in the progressive deposit of the substance, the further involvement of new fibres and cells and finally neuroglia reaction. The authors take a somewhat conservative attitude with regard to what is called "Alzheimer's disease," and consider the plaques the result of a process which has close affinities with the senile involution of the cortex. It must be emphasised that the special alteration of the neurofibrils described by Alzheimer has not as yet been discovered in a normal brain of an aged person. The article is illustrated by numerous coloured plates.

C. MACFIE CAMPBELL.

**EPIDERMOID CHOLESTEATOMA OF THE BRAIN** (Zur Kasuistik (150) der epidermoidalen Cholesteatome des Gehirns.) W. R. MEYER, *Virchow's Archiv.*, Bd. 211, H. 2, 1913, S. 161.

AUTHOR regards this type of tumour as congenital, belonging to the group of the so-called Choristomata. The case described by him is that of a female, æt. 20 years, who died in hospital from tuberculous peritonitis. There were no symptoms present during life suggestive of brain tumour. At the base of the brain there was found post mortem a tumour about the size of a hazel nut situated between the pons and the left temporo-sphenoidal lobe. The surface was irregular and had the appearance of mother-of-pearl. On section the substance was seen to consist of white, dry, crumbling material. Microscopically all the information given by the author is that the tumour was a typical cholesteatoma.

JAMES MILLER.

## CLINICAL NEUROLOGY.

**ABSENCE OF THE KNEE AND ACHILLES JERKS WITHOUT**  
(151) **OTHER SIGN OF DISEASE OF THE NERVOUS SYSTEM.**  
(De l'absence des réflexes achilléens et des réflexes rotuliens sans autre signe d'affection du système nerveux.) DUPUY, *Nouv. Icon. de la Salpêtr.*, March-April 1912, p. 153

IN a careful examination of the reflexes of 2,304 members of the Garde républicain the author has occasionally found the knee jerks or Achilles jerks absent. In some instances there have been indications of disease of the central nervous system hitherto unsuspected.

In others, however, absence of those jerks may be noted by itself alone. In most instances it is unilateral: if bilateral, the Achilles jerks are more frequently lost than the knee jerks. It must always be considered pathological, and the author has found that the commonest causes are preceding neuritis, or root involvement from gonorrhœa, syphilis, tuberculosis or alcoholism, incipient tabes, affections involving the intestine, and trauma of the nerves, roots, or cord centres.

S. A. K. WILSON.

**ON SENSORY CONDUCTION IN THE HUMAN SPINAL CORD.** (Zur (152) *Frage nach der sensiblen Leitung im menschlichen Rückenmark.*)  
H. FABRITIUS, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 2, 3, 4, 5, 6, 1912.

THE author reports eight cases of stab wounds of the spinal cord, one of which ended fatally six days after the injury, and tabulates eighty-three cases. The author concludes that hyperæsthesia is found if the transverse lesion is abrupt and leads to a complete paralysis, and if the pain tracts of the paralysed side are intact. If they are not intact then there is an analgesia and no hyperæsthesia occurs even although the sense of touch is not impaired. Hyperæsthesia is not observed if the interruption of the paths occurs gradually or if an acute disorder leads to an incomplete paralysis. The sensory tracts in the intact cord, and the sensory paths after interference with the normal tracts, must be differentiated. In the normal cord all cutaneous sensations are conducted through contralateral tracts which ascend in the lateral column. Sensations of touch and pressure have in addition paths of conduction in the homolateral posterior column while pain and thermal sensations have only crossed tracts. If there is an interruption of these paths, of the contralateral tracts of one side of the body, temperature and pain sense disappear. Touch and pressure may still be perceived, but the sensations are apt to be more dull than normal. These sensations lack completely all feeling-tone no matter what the type of stimulus is. This is the condition for an indefinite time after the injury. Gradually a new sensory condition develops, touch and pressure are recognised as before, strong mechanical stimuli and high and low thermal stimuli cause a peculiar unfamiliar prickling feeling which radiates strongly and is accompanied by lively muscular twitches. This unpleasant feeling does not consist of pain as experienced when the normal areas are stimulated. The discrimination of heat and cold is still lost except for great heat. The localisation of stimuli is disturbed by the radiation of the sensation. This type of sensibility represents an older phylogenetic stage. The cord, therefore, is able to a large degree to make up for defects due to interruption of the normal



paths of conduction. The tracts of cutaneous sensation are anatomically divided into two different groups; similarly the stimuli of the outer world are of twofold nature in their importance for the organism. On the other hand they yield information about the outer world; on the one hand they have a vital importance for the individual (powerful mechanical stimuli, pain and thermal stimuli). These latter sensations are conducted in the contralateral paths. Conditions of consciousness corresponding to them are distinguished by a more or less strong feeling-tone. This quality is completely absent in the sensations conducted by the posterior columns. The posterior columns and the corresponding impressions have a more objective, the contralateral paths and their correlates in consciousness have a more subjective, vital importance for the individual.

C. MACFIE CAMPBELL.

**ON THE DIFFERENTIAL DIAGNOSIS OF INTRA- AND EXTRA-  
(153) MEDULLARY SPINAL DISORDERS.** (Zur Differentialdiagnose der intra- und extramedullären Rückenmarkserkrankungen.) H. FABRITIUS, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 1, 1912.

THE author lays great stress on the importance of a careful examination of the thermal sense. A complete contralateral loss of discrimination between heat and cold with only moderately pronounced spinal symptoms points strongly in the direction of an intramedullary process. The author reports two cases.

C. MACFIE CAMPBELL.

**ANOTHER CASE OF FRIEDREICH'S DISEASE WITH AUTOPSY.**  
(154) (Un nouveau cas de maladie de Friedreich avec autopsie.) ALEXANDRE A. LAMBRIOR, *Rev. Neurol.*, Ann. xxi, Jan. 30, 1913, p. 58.

THE clinical history is given, and the results of a complete and detailed histological examination. The findings are in accord with those generally accepted as forming the pathological basis in Friedreich's disease.

P. W. SAUNDERS.

**HERPES ZOSTER FRONTALIS WITH BACTERIAL FINDINGS IN  
(155) THE GASSERIAN GANGLION.** (Herpes zoster frontalis med bakteriefund i ganglion Gasseri.) A. SUNDE, *Norsk Mag. f. Lægevid.*, 1913, lxxiv., p. 339.

A MAN, aged 81, admitted to hospital for senile dementia, developed herpes zoster of the right half of the forehead and right upper eyelid. Death from broncho-pneumonia took place three days later. Post mortem the right Gasserian ganglion was found to be

considerably swollen and nearly double the size of the left. In addition to hyperæmia, hæmorrhage, and round-celled infiltration, a number of Gram-positive cocci were found. They were mostly diplococci, and were most numerous in the hæmorrhages and in and about the small vessels.

Sunde could find no previous record of bacterial findings in the spinal ganglia in herpes zoster.

J. D. ROLLESTON.

**REFLEX ZOSTER IN LITHIASIS.** (*Quelques cas de zonas réflexes* (156) *chez des lithiasiques.*) G. BÉCUS, *Bull. et. mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 333.

A RECORD of three cases of an eruption with all the characteristics of secondary symptomatic zoster running its course apart from any seasonal or epidemic influence, and almost without fever. The patients had no spinal nor vertebral lesions, and were not suffering from tuberculosis or any other infection.

In the first case, a woman aged 42, the subject of cholelithiasis, the eruption was strictly limited to the 8th and 9th dorsal nerves, while the neuralgic pain was less definite in its distribution, though more intense in the course of these nerves. In the second and third cases, men aged 58 and 53 respectively, both suffering from renal calculus, the neuralgia and the zoster occupied the reno-ureteral zone which is innervated by the 11th and 12th dorsal and 1st lumbar nerves.

Other examples of reflex zoster are quoted from the literature, including Siding's case (*v. Review*, 1909, vii., p. 360).

J. D. ROLLESTON.

**HERPES ZOSTER IN THE PUERPERIUM.** (*Herpes zoster im* (157) *Wochenbett.*) H. KUNZ, *Zentralbl. f. Gynäk.*, 1913, xxxvii., p. 121.

A GIRL, aged 18, gave birth to a child by normal labour on 27th June. On 1st July herpes zoster developed in the area of the 8th and 9th left intercostal nerves. No typical neuralgic pains preceded or accompanied the eruption. No puerperal or any other infection was present.

J. D. ROLLESTON.

**A CASE OF JUVENILE TABES.** T. GILLMAN MOORHEAD, *Dublin* (158) *Journ. Med. Sci.*, 1913, cxxxv., p. 167.

A RECORD of a case in a woman, aged 22, a virgin, who showed no clinical signs of acquired or inherited syphilis. The family history, however, was suggestive, and Wassermann's reaction in the patient's blood was positive, becoming negative after an intravenous injection of salvarsan.

J. D. ROLLESTON.

**THE CENTRAL CONVOLUTIONS IN TABES DORSALIS.** (Die (159) *Zentralwindungen bei Tabes dorsalis.*) L. SELLING, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 32, H. 2, 1912.

IN four cases of tabes the cerebral cortex showed no constant changes and no deficiency in nerve cells was observed. The nerve cells were somewhat altered and the glia showed some proliferation. The author, therefore, disagrees with Campbell's contention that in the posterior central convolutions of tabetics there are characteristic cortical changes which can be correlated with the degeneration of the sensory tracts.

C. MACFIE CAMPBELL.

**TABETIC ARTHROPATHY. PHARYNGEAL CRISES.** (Arthro- (160) *pathic tábétique. Crises pharyngées.*) R. PIERRET and E. DUBOT, *Echo méd. du Nord.*, 1912, xvi., p. 566.

A WOMAN, aged 52, who had had spontaneous fracture of the right tibia nine years previously, presented osteo-arthropathy of the right knee, shown by considerable enlargement of the femoral condyles and heads of the tibia, marked laxity of the muscles and ligaments, enormous sero-fibrinous effusion in which Wassermann's reaction was positive, and oedema of the neighbouring tissues. Several times in the course of the day she had a series of deglutitions accompanied by a clucking noise, for which she had been nicknamed "the hen." After a fortnight's treatment with soluble salts of mercury, as recommended by Babinski and Bauré, the circumference of the enlarged knee diminished by 4 cm.

J. D. ROLLESTON.

**PURULENT PNEUMOCOCCAL MENINGITIS. ABSENCE OF (161) CELLULAR REACTION IN CEREBRO-SPINAL FLUID.** (Meningite purulente à pneumocoques; absence de réactions cellulaires dans le liquide céphalo-rachidien.) MONIER-VINARD and DOUZELOT, *Bull. et. mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 468.

A CASE of fulminating cerebro-spinal meningitis, accompanied with hepatisation of the right apex and pneumococcal septicæmia in a bronchitic, atheromatous, and probably alcoholic man of 54. The absence of leucocytes in the cerebro-spinal fluid, which was withdrawn six hours before death, is attributed to their being imprisoned in a fibrinous network in the meninges similar to that present in the lung.

Reference is made to six similar cases in literature, including that reported by Castaigne and Debré (*v. Review*, 1909, vii., p. 110).

J. D. ROLLESTON.

**PARAMENINGOCOCCUS CEREBRO-SPINAL MENINGITIS.** (Un cas (162) de méningite cérébro-spinale à paraméningocoques.) P. MENETRIER and LEGRAIN, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 461.

A WOMAN, aged 29, the subject of chronic alcoholism, was attacked with symptoms of cerebro-spinal meningitis. During the first week she received 105 c.c. of anti-meningococcic serum. As she got worse anti-parameningococcic serum was used, and 150 c.c. were given intraspinally and 70 intravenously in the course of six days. The presence of the parameningococcus in the cerebro-spinal fluid was established by Dopter. Slight improvement occurred, but death took place from broncho-pneumonia within a fortnight of the onset of the disease. A better result would probably have been obtained had the specific serum been used earlier. In addition to the meningitis, which was principally localised in the spinal meninges, the necropsy showed chronic nephritis and cirrhosis of the liver, which doubtless contributed to the fatal issue.

J. D. ROLLESTON.

**PARAMENINGOCOCCUS CEREBRO-SPINAL MENINGITIS. MENINGOCOCCIC AND PARAMENINGOCOCCIC SEROTHERAPY. DEATH.** (Méningite cérébro-spinale à paraméningocoque. Sérothérapie méningococcique et paraméningococcique. Mort.) A. FOLLET and J. BOURDINIÈRE, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 505.

THE patient was a woman, aged 27, admitted to hospital with symptoms of meningitis. There were no signs of alcoholism or syphilis. After 80 c.c. of meningococcus serum had been given without benefit, the parameningococcus was isolated from the cerebro-spinal fluid. Anti-parameningococcus serum was then given, but the general condition became worse, and the cerebro-spinal fluid more purulent. Death took place in about three weeks from the onset. The failure of treatment may have been due either to anaphylaxis or to a special kind of parameningococcus which was not affected by the serum used.

J. D. ROLLESTON.

**PARAMENINGOCOCCUS MENINGITIS TREATED AND CURED** (164) **BY ANTI-PARAMENINGOCOCCUS SERUM.** (Un cas de méningite à paraméningocoques traitée et guérie par le sérum anti-paraméningococcique.) H. MÉRY, H. SALIN, and A. WILBOERTS, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 411.

A GIRL, aged 3 years, was admitted to hospital with symptoms of cerebro-spinal meningitis. The cerebro-spinal fluid was turbid, and showed a few intracellular organisms resembling meningococci.

Numerous injections of anti-meningococcic serum were followed by only slight and transitory improvement. The agglutination test showed that the organism was the parameningococcus. Rapid improvement followed injections of anti-parameningococcic serum, and finally recovery took place, apart from deafness due to labyrinthine involvement.

J. D. ROLLESTON.

**CACHECTIC FORM OF PARAMENINGOCOCCUS CEREBRO-SPINAL**  
(165) **MENINGITIS TREATED AND CURED BY DOPTER'S SERUM.**

(Méningite cérébro-spinale à forme cachectisante due au paraméningocoque traitée et guérie par le sérum de Dopter. H. SALIN and J. REILLY, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 423.

THE patient was a boy, aged 3 years, in whom the disease ran its course in two stages. In the first stage the symptoms were those of ordinary cerebro-spinal meningitis. The general symptoms improved after treatment with meningococcic serum, but the meningeal symptoms persisted, and the cerebro-spinal fluid was only slightly modified. In the second stage, when the temperature was almost normal, and the meningeal symptoms less marked, symptoms of cachexia appeared, shown by emaciation, amyotrophy, cutaneous pigmentation, generalised adenopathy, and torpor. The parameningococcus was then isolated from the cerebro-spinal fluid, Dopter's serum was used, and rapid and complete recovery resulted.

J. D. ROLLESTON.

**FULMINATING CEREBRO-SPINAL MENINGITIS DUE TO AN**  
(166) **UNDETERMINED COCCO-BACILLUS.** (Méningite cérébro-

spinale suraiguë à cocco-bacille indéterminé.) R. MORICHAU-BEAUCHANT, R. LE BLAYE and DELAGE, *Progrès méd.*, 1913, xli., p. 14.

A CASE of a man, aged 31, in whom sudden onset after coryza of intense meningeal symptoms, labial herpes, and a turbid cerebro-spinal fluid suggested the diagnosis of meningococcic cerebro-spinal meningitis. No improvement, however, followed injection of anti-meningococcic serum, and death took place in three days. Bacteriological examination of the fluid showed a small number of extra-cellular bacilli, not staining by Gram, and a large number of organisms resembling pneumococci. Reference is made to the recent case of Chevrel and Bourdinère (*v. Review*, 1913, xi., p. 37).

J. D. ROLLESTON.

- ARAN - DUCHENNE TYPE OF PROGRESSIVE MUSCULAR**  
 (167) **ATROPHY OF NEURITIC NATURE: SECOND CASE WITH**  
**AUTOPSY.** (*Atrophie musculaire progressive type Aran-*  
*Duchenne de nature névritique: second cas suivi d'autopsie*).  
 LONG, *Nouv. Icon. de la Salpêtr.*, July-August 1912, p. 281.

*Clinical.*—Commencement in the muscles of the left hand at the age of 53: three years later, beginning atrophy in the corresponding muscles of the right hand, and at the same time in the legs. Gradual extension of the atrophy during an evolution of 12 years (death from cancer of the stomach at the age of 65), there being wasting and weakness of all the muscles of the left arm, and of those of the hand and forearm on the right; paresis of the muscles of both leg and thigh, specially on the left, with fibrillation and partial reaction of degeneration. Loss of tendon reflexes. Intermittent pains in the limbs. No objective changes in sensibility. No sphincter troubles. Pupillary reactions normal.

*Pathological.*—Spinal cord normal, except for slight and limited alterations in the anterior horn cells in the cervical enlargement. In the peripheral nerves, atrophy of a large number of nerve fibres: hypertrophy of the sheaths of Schwann in the form of a thick cylindrical surround: intrafascicular connective tissue very dense, without increase in the dimensions of the nerve trunks: hypertrophy of the coats of some of the vasa nervorum. These nerve lesions are systematised: they affect the mixed nerves and the anterior roots close to the posterior root ganglia: the cutaneous nerves and posterior roots are practically normal. Interstitial myositis of the muscles, with atrophy of the striated muscle fibres.

The case is excellently worked out, and there is a series of abstracts of numerous interesting cases, more or less analogous. The author discusses the relations of the neuritic form of progressive muscular atrophy to peroneal muscular atrophy, chronic hypertrophic interstitial neuritis, &c. S. A. K. WILSON.

- UNILATERAL PROGRESSIVE MUSCULAR DYSTROPHY: FACIO-**  
 (168) **SCAPULO-HUMERAL TYPE.** (*Dystrophie musculaire pro-*  
*gressive hémilatérale: type facio-scapulo-huméral*). MINGAZZINI,  
*Nouv. Icon. de la Salpêtr.*, July-August, 1912, p. 320.

A CASE of Landouzy-Dejerine muscular atrophy in a youth of 16, already of four years' duration, in which the amyotrophy is strictly confined to the right side of the body. (It is stated, however, that the left shoulder blade has a tendency "à prendre la forme de l'omoplate ailée"). The author has been unable to find a record of any similar case. S. A. K. WILSON.

**ISOLATED AND STATIONARY ATROPHY OF THE SMALL  
(169) MUSCLES OF THE HAND: ANTERIOR TEPHROMALACIA.**

(L'atrophie isolée non progressive des petits muscle de la main : téphromalacie antérieure.) PIERRE MARIE and FOIX, *Nouv. Icon. de la Salpêtr.*, Sept.-Oct. 1912, p. 353, and Nov.-Dec., p. 427.

THE authors describe an interesting condition, clinically and pathologically, in which there is a unilateral atrophy (occasionally bilateral) of the small muscles of the hand—thenor, hypothenar, or interossei, or diffuse—an atrophy which is strictly limited and stationary. They have been able to make three pathological examinations in their case, and have found a curious general shrinkage of one half of the cord, and a still more striking atrophy of the anterior horn of grey matter, which in some instances is reduced to a mere linear cicatrix. In most cases the prime factor in the production of the disease has been preceding syphilis, and the authors conclude that the pathogenesis is a chronic ischaemia of the grey matter from partial obstruction (not thrombosis) of the branches of the anterior spinal artery supplying the part affected. They are unable to offer any explanation of the condition being so very frequently unilateral, and of its being restricted to the inferior cervical segments.

S. A. K. WILSON.

**A REMARKABLE CASE OF DIPHTHERITIC PARALYSIS. (Caso  
(170) notable de parálisis difterica.)** A. CUBELLS, *La medicina valenciana*, 1912, xii., p. 65.

A GIRL, aged 4 years, about a fortnight after an attack of diphtheria treated with antitoxin, was seized with convulsions and loss of consciousness. The following day she developed left hemiplegia and palatal palsy. Three further injections of antitoxin were given, and within a fortnight complete recovery took place. Cubells alludes to the cases of diphtheritic pseudo-tetanus reported by Bitot and others (*v. Review* 1910, viii., p. 562 and 1912, x. p. 337).

J. D. ROLLESTON.

**PATHOGENY OF URÆMIC PARALYSIS. (Pathogénie des paralysies  
(171) urémiques.)** H. DUFOUR, *Bull. et. mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 449.

IN cases of Bright's disease with uræmic paralysis Dufour has always found post mortem either areas of softening or hæmorrhage of more or less considerable extent. He records an illustrative case in a man, aged 37, the subject of Bright's disease, who was admitted to hospital with left hemiplegia and Babinski's sign. The hemiplegia cleared up in a few weeks, but returned a month

later, when death took place from septic pneumonia. Post mortem an old hæmorrhage was found in the putamen of the right lenticular nucleus.

J. D. ROLLESTON.

**UNILATERAL ARGYLL ROBERTSON PUPIL DUE TO ORBITAL (172) TRAUMA.** (Signe d'Argyll Robertson unilatéral par traumatisme orbitaire.) E. VELTER, *Archives d'Ophthalmol.*, Vol. 33, No. 2, Feb. 1913, p. 120.

THE only previous case of this nature known to Velter is that of Ohm (*Centralbl. f. prakt. Augenheilk.*, July 1907, p. 193), a non-syphilitic youth of 19, who showed also a partial palsy of the homolateral third and sixth nerves. Velter's case was a neurasthenic man of 58, who, in 1900, shot himself in the right temple with two bullets: this was followed by slight headache, visual troubles, and diplopia, which have persisted. Patient says that for eighteen months the right pupil was widely dilated, and then gradually became narrowed. Examination shows a normal left eye; the right shows slight enophthalmos and narrowing of palpebral fissure. R. pupil myosis, L. slightly dilated. Galassi's palpebral sign is feebler on right. Partial atrophy of right optic disc: no trace of neuritis: partial sixth nerve palsy. Nervous system normal: no lymphocytosis, negative Wassermann. Radiography locates the bullets on inner orbital wall. No evidence of antecedent syphilis obtainable; no alcoholism, lead, diabetes, or albuminuria. Velter admits that there may have been a complete pupillary palsy after the trauma, and that the loss of the light reaction may have been the only residual effect of this. The four typical light-reactions of the unilateral A. R. pupil were present in Velter's case.

LEONARD J. KIDD.

**OXYCEPHALY AND EXOPHTHALMOS.** (*Oxicefalia ed esoftalmo.*) (173) *Rassegna di Studi Psichiat.*, Vol. iii., F. 1, Gennaio-Febbraio 1913, p. 14.

THE author describes two cases of marked oxycephaly, with congenital bilateral exophthalmos and signs of rickets, but with no disturbance of sight, and considers that "oxycephaly with exophthalmos" is not a clinical entity, but merely a high grade of oxycephaly in which the projection of the eyeball results simply from the flattening of the frontal bones and the diminution in the depth of the orbital cavity. Rickets plays an important part in the etiology.

A. NINIAN BRUCE.



**PARTIAL SYMMETRICAL MICROGYRIA OF THE CEREBRAL**

- (174) **HEMISPHERES AND ITS PROBABLE COMPENSATORY EFFECTS.** (Su d'una particolare microgria parziale simmetrica negli emisferi cerebrali, e sui consecutivi probabili effetti compensativi.) G. D'ABUNDO, *Riv. ital. di Neurop., Psychiatr. ed Elettrotet.*, 1913, vi., p. 1.

A RECORD of a case in which the clinical diagnosis was infantile spastic left hemiplegia which had developed at the age of 6 months. Death from pneumonia occurred when the patient was aged 29 years, when the necropsy revealed symmetrical microgyria taking the place of part of the central lobe on either side.

The right cerebral hemisphere was less developed than the left, but a small part of the caudate nucleus and the lenticular nucleus, especially in its posterior portion, was more developed on the right than on the left side. The atrophy of the right cerebral hemisphere was accompanied by atrophy of the left cerebellar hemisphere.

J. D. ROLLESTON.

**OBSERVATIONS CONCERNING THE RELATIONS EXISTING**

- (175) **BETWEEN THE VESTIBULAR APPARATUS AND THE CENTRAL NERVOUS SYSTEM—CEREBELLAR AND VESTIBULAR SYMPTOMS CAUSED BY CEREBRAL TUMOURS ACTING FROM A DISTANCE.** (Nouvelles recherches et observations concernant les relations existant entre l'appareil vestibulaire et le système nerveux central. Symptômes cérébelleux et vestibulaires à distance provoqués par des tumeurs cérébrales.) R. BARANY, *Rev. Neurol.*, No. I, Jan. 15, 1913, p. 1.

A CASE is described of a right frontal tumour in which the localising signs were very slight, and were mainly of a cerebellar character. There were noises in the ears, vertigo, slight nystagmus, a little deviation of the head to the right and down, and some deviation of the left arm to the right in doing prescribed movements.

The details of caloric and rotation tests are given in full, and they indicated, the author thinks, that there was no actual cerebellar lesion present.

Proceeding from this particular case the author presents briefly conclusions based on an examination of thirty-six such cases; twenty-nine of these were instances of tumours outside the cerebellum, and mostly supratentorial, and seven were examples of intra-cerebellar tumours. All of them manifested cerebellar symptoms. He says, in effect, that while tumours situated in any region of the brain may show themselves by cerebellar symptoms on the same side, or on the other side, repeated

examinations by the caloric and rotation methods afford delicate tests for determining whether the deviations from the normal that may be present are slight or marked, transitory or permanent, and so give a useful indication as to whether the vestibular centres are interfered with directly and actually, or only indirectly, by the general increased intracranial pressure.

Amongst the tabulated conclusions there is a brief, interesting mention of the occurrence of deafness and subjective auditory sensations in eighth nerve and other tumours.

P. W. SAUNDERS.

**THE DIAGNOSTIC VALUE OF UNILATERAL CHOKED DISC (176) AND UNILATERAL EXOPHTHALMUS IN BRAIN TUMOUR.**  
(Zur Frage der diagnostischen Verwertbarkeit der einseitigen Stauungs-papille und des einseitigen Exophthalmus bei Hirntumor.) MOHR, *Deut. Ztschr. f. Augenheilk.*, Bd. 50, 1912.

THIS paper is a statistical inquiry directed towards the problem of the localisation of brain tumours when choked disc occurs on one side only, or is more prominent on one side.

The author has studied the numerous cases collected by Uhthoff, including 800 cases with post-mortem examination, and also material from other sources.

All unsuitable cases were excluded, and the remainder divided into five groups.

1. Unilateral choked disc. Here in 41 cases the choked disc was on the side of the tumour (ipsilateral) in 56 per cent., and on the other side—contralateral—in 44 per cent.

2. Unilateral optic neuritis. In 10 cases the neuritis was ipsilateral in 8, contralateral in 2.

3. Bilateral optic neuritis or choked disc more prominent on one side. In 65 cases the more prominent disc was ipsilateral in 72 per cent., contralateral in 27 per cent.

4. In 10 cases there was choked disc on one side, and optic atrophy on the other. Primary and secondary atrophy were not differentiated. In all cases the atrophy was on the side of the tumour.

5. Retinal hæmorrhages in association with choked disc. Here, in opposition to the findings of Horsley, the hæmorrhages were more often contralateral—8 to 5 ipsilateral.

In regard to the exact locality of the tumours further details are given which show that this has little if any influence as a determining factor.

The author's figures support Paton's view that no practical significance for purposes of localisation can be attached to changes on the fundus oculi in cases of brain tumour.

On the other hand unilateral exophthalmus, or the more prominent eye when the condition is bilateral, excluding, of course, cases in which the orbit is invaded by new growth, is as a rule on the side of the tumour. In 20 cases the exophthalmus was ipsilateral in 17, contralateral in 3. This corresponds with the theory that the exophthalmus is due to obstruction of the orbital veins by pressure on the cavernous sinus or otherwise.

H. M. TRAQUAIR.

**ON CARCINOMA METASTASES IN THE CEREBELLUM.** (Ueber (177) *Karzinommetastasen im Kleinhirn.*) P. GIRARDI, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 2, 1912.

THE report of a case illustrated by five drawings of the microscopical appearances.

C. MACFIE CAMPBELL.

**ON EXPERIMENTAL INVESTIGATIONS ON THE INFLUENCE (178) OF CEREBRAL HÆMORRHAGE, CEREBRAL EMBOLISM, EPILEPTIC ATTACKS AND CONCUSSION ON THE CIRCULATION IN THE BRAIN.** (Experimentelle Untersuchungen über die Einwirkung von Gehirnblutungen, GehirneMBOLISM, epileptischen Anfällen und Gehirnerschütterungen auf die Blutzirkulation im Gehirn.) H. BERGER, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 5, 1912.

THE usual assumption has been that in the conditions referred to in this article, the sudden loss of consciousness is due to a cortical anæmia due to a contraction of the pial vessels. In experiments on dogs with regard to these conditions, the author demonstrated no general contraction of the cortical vessels, but rather a dilatation of the vessels even of the hemisphere not operated on. The loss of consciousness in these conditions does not appear to be due to cortical anæmia of reflex origin.

C. MACFIE CAMPBELL.

**AN APPROACH TO THE HYPOPHYSIS THROUGH THE ANTERIOR (179) CRANIAL FOSSA.** C. H. FRAZIER, *Annals of Surgery*, Vol. lvii., Feb. 1913, p. 145 (3 figs.).

FRAZIER has applied his operative method successfully in two cases: particulars are given of one of these, a case of pituitary cyst. He finds the operation as easy as Gasserianectomy, though somewhat more complicated. Although he recognises that the transphenoidal route will be needed in some cases, he believes that the intracranial route through the anterior fossa will be preferred in the future.

He "reflects an osteoplastic flap from the right frontal region,

removes *en bloc* the supraorbital ridge with a portion of the orbital roof, later to be replaced, and *rongeurs* away what remains of the orbital roof down to the optic foramen. With the elevation of the frontal lobe and the depression of the orbital contents, a free and adequate exposure is secured, and there remains only to make a short incision in the dura to lay bare the cavity of the sella."

Frazier's method is a modification of M'Arthur's (*v. Review*, x., 1912, p. 393), but admits of greater elevation of the frontal lobe and a freer exposure of the deep-seated structures; also the portion of bone to be resected is smaller, and necrosis is less likely to occur. When radiography shows that the sella, whether deepened or shallow, has an enlarged orifice, showing that its contents have encroached on the brain and not on the sphenoidal cells, one of the intracranial methods is indicated. The intracranial method gives a broad avenue of approach and less risk of infection than the transphenoidal method.

LEONARD J. KIDD.

**NYSTAGMUS IN FEVER.** (*Ueber nystagmus bei Fieber.*) O. BECK (180) and P. BIACH, *Wien. klin. Woch.*, 1912, xxv., p. 1831.

THE writers examined fifty-six cases in which fever was not due to ear disease, such as pneumonia, acute rheumatism, tonsilitis, pericarditis, gastro-intestinal infections, and scarlet fever. In the majority the nystagmus appeared at the onset of the fever and disappeared when the temperature became normal, but in a certain number the nystagmus outlasted the fever. Strange to say no nystagmus was seen in twelve typhoid patients who showed more or less severe cerebral symptoms, nor in any cases of tuberculosis except the miliary variety. The writers suggest that the nystagmus is due to cerebral hyperæmia or œdema in the region of the posterior cerebral fossa, and compare the phenomenon to the transitory loss of knee jerks, or the presence of Babinski's sign in febrile disorders.

J. D. ROLLESTON.

**NYSTAGMUS IN FEBRILE DISEASES.** (*Ueber Nystagmus bei (181) fieberhaften Krankheiten.*) E. v. CZYHLARZ, *Berlin. klin. Woch.*, 1913, l., p. 112.

CZYHLARZ found that nystagmus was especially frequent in diseases whose onset was accompanied by a high temperature, such as erysipelas, lobar pneumonia, severe rheumatism, and influenza.

His observations entirely agree with those of Beck and Biach except as regards typhoid fever and tuberculosis.

Though nystagmus was usually absent during the first fortnight of typhoid, Czyhlarz found that it usually appeared later and per-

sisted long after the temperature had become normal. He also found nystagmus present in tuberculosis without there being any definite evidence that it was the miliary form.

J. D. ROLLESTON.

**ACROMEGALIC GIGANTISM WITHOUT ENLARGEMENT OF THE**  
(182) **SELLA TURCICA: SEXUAL INVERSION AND "MENTAL FEMINISM."** GALLAIN, *Nouv. Icon. de la Salpêtr.*, March-April 1912, p. 124.

THE patient is a young man of 25, whose height is 1.86 metres. His face is smooth and puerile; he has a wide pelvis and convergent femora. He is very fat, with prominent breasts. The external genitalia are normally formed and there is no azoospermia. The hands and feet are definitely acromegalic, of the "type en long" of Pierre Marie. The sella turcica is of normal dimensions. His mental condition is one of definite inversion, of which the author supplies abundant evidence.

S. A. K. WILSON.

**PITUITARY GLYCOSURIA IN HUMAN AND ANIMAL TUBERCULOSIS.**  
(183) **CULOSIS.** (La glycosurie hypophysaire chez l'homme et l'animal tuberculeux.) H. CLAUDE, A. BAUDOUIN, and R. PORAK, *Compt. Rend. Soc. de Biol.*, Vol. 74, No. 10, March 14, 1913, p. 529.

USING the technique employed by Claude and Baudouin in their previous experimental work on pituitary glycosuria (*v. Review*, Vol. xi., January 1913, p. 49), the authors failed to obtain glycosuria after injection of posterior pituitary lobe extract in twelve young subjects suffering from definite pulmonary tuberculosis, although they all showed the general symptoms of posterior lobe extract injection, viz., cardiovascular phenomena, often intense, and in the case of women, painful uterine contractions. The authors found also that in six rabbits, in which in the normal state pituitary glycosuria was produced by these injections, it could not be made to appear after experimental tuberculisatation. They conclude that impregnation of the organism with tuberculous poison causes the disappearance of the faculty of producing hypophysial glycosuria: in this respect tuberculosis differs strikingly from arthritism.

LEONARD J. KIDD.

**CLEIDO-CRANIAL DYSOSTOSIS.** (Sur un cas de dysostose cléido-cranienne.) MALDARESCO and PARHON, *Nouv. Icon. de la Salpêtr.*, May-June, 1912, p. 251.

A TYPICAL case of this rare disease [the authors say they have found only 33 definite cases recorded, but in their bibliography they omit at least two, if not more, English cases], in a man of 40.

It is very interesting to note that a number of the recorded cases showed considerable obesity. For somewhat inadequate reasons the authors are inclined to class the disease as a dystrophy of polyglandular origin.

S. A. K. WILSON.

**CURE OF TETANUS BY INTRA-SPINAL SEROTHERAPY.**

(185) (Guérison d'un cas de tétanos traité par la sérothérapie intrarachidienne.) E. MERLE, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 406.

THE patient was a boy, aged 14 years, who received 80 c.c. of antitetanic serum by intraspinal injection within five days, in addition to two doses of 20 c.c. subcutaneously.

J. D. ROLLESTON.

**ON THE RECURRENCE OF NERVOUS SYMPTOMS OF LUEtic**

(186) **ORIGIN.** (Ueber die Neurorezidive der luetischen Affektionen des Nervensystems.) A. ROMAGNA-MANOIA, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 32, H. 1, 1912.

THE author reports very briefly the clinical history of eighty cases. He concludes that syphilis of the nervous system is more apt to recur in the male than in the female. The age at which lues was acquired is of some importance in this respect. In a majority of the cases with recurrence of nervous symptoms syphilis was acquired between 15 and 30. In a majority of the cases the recurrence occurred within the first year after the development of the nervous symptoms. Gummatous meningitis has the greatest tendency to recur; next in order come mixed forms, cerebral endarteritis, and finally peripheral neuritis. The etiological factors of importance are unsatisfactory treatment of the initial infection and of the nervous symptoms, chronic alcoholism, neuropathic heredity, and general malnutrition.

C. MACFIE CAMPBELL.

**REMARKS UPON SOME RECENT STUDIES IN THE PATHO-**

(187) **GENESIS OF EPILEPSY.** L. PIERCE CLARK, *Boston Med. and Surg. Journ.*, Vol. clxvii., No. 3, pp. 78-81, July 18, 1912.

THE writer discusses the two main theories as to the causation of epilepsy, those, namely, of heredity and of toxic action. He is of opinion that in most cases both of these factors come into play. He describes recent observations on the toxicity of the blood of epileptics, and of the urine after a fit, as shown by the effect produced when injected into animals. He discourages the sedative treatment of epilepsy as long as there is hope of bringing the real causal factor of the disease under control.

W. BOYD.

**ON THE PRECIPITATING CAUSES OF CERTAIN NEUROSES AND**  
 (188) **PSYCHOSES** (Ueber Gelegenheitsursachen gewisser Neurosen  
 und Psychosen.) H. BERTSCHINGER, *Allg. Ztschr. f. Psychiat.*, Bd.  
 69, H. 5, 1912.

THE author discusses in a most interesting manner the reason for the actual manifestation of a disorder which has been latent for many years. He does not confine himself to any one disease type but bases his remarks on a great variety of cases, which he reports in a very summary manner. The incident which precipitates the psychosis may be apparently unimportant and seem an inadequate cause, but it may be sufficient to make impossible the continuation of the compromise of which so many lives consist. The author cites many cases to illustrate what he means by this compromise or life-falsehood, where beneath conventional happiness and satisfaction there are latent strong unsatisfied longings and bitter disappointments. When faced with serious difficulties in gaining satisfaction from life, the individual may make use of conversion into physical symptoms and various types of invalidism or alcoholism or unusual application to business affairs, or affection may become centred on some other person than the one where satisfaction is denied. Beneath an apparently harmonious married life residuals from a previous love affair exist and actual disharmonies are repressed. The cases cited by the author illustrate the development of a neurosis or psychosis when the fiction on which the individual's life is based becomes no longer tenable.

C. MACFIE CAMPBELL.

**A STUDY IN HYSTERIA AND MULTIPLE PERSONALITY, WITH**  
 (189) **REPORT OF A CASE.** J. W. MITCHELL, *Special Medical Part of*  
*Proc. Soc. Psychiat. Research*, Vol. xxvi., Nov. 1912.

AN account of an extraordinary and very carefully observed case of hysteria and multiple personality. The case was under observation for ten years. The illness began acutely with a moderate temperature. There were rhythmic movements, paralysis, anaesthesia, photophobia, and curious speech defects, there being a great preponderance of sibilants. For many months she was almost totally word-blind. Eighteen months after the onset of the illness she recovered in every respect, with the exception of right hemianalgesia, which persisted for six years. Two years later she had another similar attack. On this occasion there was a sanguinous discharge from the left ear, and blood oozed from the lower eyelid on the left side. After a year the symptoms again completely disappeared. Three years later a third attack developed. The author now tried the effects of hypnotism, and succeeded in abolishing the physical symptoms. At the same

time he made the discovery that he was dealing not with one personality, but with three. Psycho-analysis was resorted to, and revealed the fact that this disintegration of personality was caused by certain emotional shocks which had occurred some time previously. By means of suggestion all of the symptoms, both physical and mental, were finally made to disappear.

W. BOYD.

## PSYCHIATRY.

**ON THE PATHO-PHYSIOLOGICAL INTERPRETATION OF THE**  
(190) **ATTACKS AND DELIRIA IN GENERAL PARALYSIS.** (Zur pathophysiologischen Auffassung der Anfälle und Delirien bei Paralysis progressiva.) H. SCHROTTENBACH, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 3, 1912.

IN the paralytic attack and the paralytic delirium, leucocytosis occurs. Apoplectiform attacks always show a higher leucocyte count than the epileptiform attacks. The latter show higher counts than the mild transitory delirious attacks. The leucocytosis goes parallel with the exacerbations or remissions of the symptom-picture. These findings warrant the assumption of a toxic or infectious cause of exogenous or endogenous character.

C. MACFIE CAMPBELL.

**THE CONVICTION AND IMPRISONMENT OF GENERAL PARA-**  
(191) **LYTICS.** (Paralysés généraux condamnés et incarcérés.) ALEX. PARIS, *Arch. Internat. de Neurol.*, No. 3, March 1913, p. 137.

THE author records the cases of three typical general paralytics who were convicted of theft and other offences and served their term in prison. He mentions also the case shown by Dupré at a meeting of the *Société de Psychiatrie* on 24th October 1912, of a general paralytic who was condemned to three months' imprisonment for theft, in spite of the presence of extreme defect of articulation, an absurd degree of euphoria, and absolute unconsciousness of his situation. The author suggests a periodical medical supervision for such cases in "houses of arrest," but he does not go very fully into particulars in this short paper.

LEONARD J. KIDD.

**URETHRITIS IN GENERAL PARALYSIS, WITH REMARKS ON**  
(192) **THE EXHIBITION OF HEXAMETHYLENE-TETRAMINE.**  
HARVEY BAIRD, *Journ. Ment. Sc.*, Vol. lix., No. 244, Jan. 1913, p. 75.

THE posterior portion of the urethra was examined histologically in 28 cases. Five were normal. Of the 23 cases which showed



evidence of disease, 7 paralytics and 3 non-paralytics were slightly involved, 6 paralytics and 3 others had well-marked lesions, and 3 paralytics and 1 non-paralytic very marked. All the paralytics showed evidence of urethritis.

Hexamethylene-tetramine was used in the treatment of the disease, and the author thinks that the duration of the malady was somewhat prolonged. The number of seizures was diminished to a slight extent.

W. BOYD.

**CEREBRAL CYSTICERCOSIS AND GENERAL PARALYSIS**  
(193) (*Cysticercose cérébrale et paralysie générale.*) A. VIGOUROUX  
and HÉRISSON-LAPARU, *Soc. Anat. de Paris*, 7 Mars 1913. (*La Presse Méd.*, No. 23, March 19, 1913, p. 225.)

A MAN of 54 showed the syndrome of general paralysis with numerous epileptiform attacks. Autopsy showed that numerous cysticerci of all sizes had invaded the brain, heart, and certain muscles: the cerebral hemispheres were most affected. The subpial and the intracerebral cysticerci had caused in every instance an intense inflammatory reaction: there was diffuse meningo-encephalitis. The question is left open whether this latter was produced by the cysticerci or was present before they appeared.

LEONARD J. KIDD.

**ON THE HISTOPATHOLOGY OF CYSTICERCUS IN THE BRAIN.**  
(194) (*Zur Histopathologie der Gehirncysticercose.*) K. KRAUSE,  
*Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 5, 1912.

THE author reports two cases of cysticercus in the brain with very chronic course in which there was a marked dementia. He describes in detail diffuse cortical changes which he attributes to the presence of the cysticerci, which maintain a chronic inflammatory process in the membranes and the cortical vessels. In both cases there was papilloedema, although there was no definite basal meningitis.

C. MACFIE CAMPBELL.

**PLURIGLANDULAR ENDOCRINIC SYNDROME AND DEMENTIA**  
(195) **PRÆCOX.** (*Considerações sobre um caso de síndrome pluri-glandular endocrínica e dementia precoce.*) F. V. de MORAES  
and P. PERNAMBUCO, *Arch. Brasil. de Med.*, 1912, ii., p. 671.

A RECORD of a case in an heredo-syphilitic woman, aged 19, the subject of dementia præcox. Involvement of the ovaries, supra-renals, and thyroid was shown by menstrual irregularities, pigmentation of the skin, loss of axillary and pubic hair, and a goitre. No improvement followed two injections of salvarsan, followed by athyroidin and ovarin.

J. D. ROLLESTON.

**THE PATHOLOGICAL CHANGES OF THE BRAIN IN KORSAKOFF'S  
(196) PSYCHOSIS.** (Der Hirnbefund bei der Korsakoffschen Psychose.)

U. VOLLRATH, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 31, H. 4, 1912.

THE detailed report of the cortical changes in a well-marked case of Korsakoff's psychosis with a review of the literature.

C. MACFIE CAMPBELL.

**CYTOLOGICAL AND CHEMICAL RESEARCHES ON THE BLOOD  
(197) IN SCORBUTIC MENTAL CASES.** (Di alcune ricerche emocitologiche e fisico-chimiche in scorbutici alienati.)

LUIGI DANE0 and MANLIO FERRARI, *Rassegna di Studi Psichiat.*, Vol. iii., F. 1, Gennaio-Febbraio 1913, p. 6.

FROM a study of ten cases of mental disease, who also suffered from scurvy (five of which were dementia præcox), the authors find that there is a constant diminution of the red cells, a marked leucopenia with an increase in the number of the large mononuclear and transitional forms, a diminution in the lymphocytes and in the graver cases an eosinophilia. The blood pressure was greatly lowered in two severe cases. The authors consider that these facts are in favour of a toxi-infectious origin.

A. NINIAN BRUCE.

**THE IMPORTANCE OF SCHOPENHAUER FOR PSYCHIATRY**

(198) (Die Bedeutung Schopenhauers für die Psychiatrie.) OTTO JULIUSBURGER, *Allg. Ztschr. f. Psychiat.*, Bd. 69, H. 5, 1912.

AN extremely interesting study of certain views of Schopenhauer which represent in outline important modern psychiatric conceptions. Psychiatry has recently been stimulated by the work of Freud and of Bleuler who have done much to render intelligible the actual biological significance of the neuroses and the psychoses. Their conclusions had, however, been largely anticipated by the philosopher of pessimism. "If a worry or piece of knowledge or memory is so painful that it is actually insupportable and the individual would succumb to it, then panic-stricken nature reaches out to insanity as towards its final salvation. The mind thus tortured tears as it were the thread of its memory, fills out the gaps with fictions, and finds in insanity a refuge from the pain which exceeds its powers to bear." In equally clear language Schopenhauer refers to the rôle of these resistances which are so important in the Freudian psychology. If clear reason cannot assimilate by the usual associative methods some experience because the will refuses to accept it, the nucleus of the neurosis or the psychosis is already there. The philosopher has equally

recognised that many casual thoughts, judgments, resolves are the product of processes which take place at a deep level in our mental life. Schopenhauer saw the source of the most important intra-psychic conflicts in sexuality, in the wide acceptance of the term. The phrases in which he expresses his views might almost be penned by one who had reached his conclusions by means of systematic psycho-analysis. "The sexual relation is really the invisible centre of all doing and acting and everywhere it crops out despite all the veils thrown over it. It is the cause of war and the aim of peace, the basis of what is earnest and the aim of the jest, the inexhaustible source of wit, the key to all allusions, the meaning of all secret signs, of all unspoken offers and of all stolen glances, the thoughts and aim of the young and often of the old, the hourly thought of the unchaste and the constant unconscious reverie of the chaste, the ever ready stuff for jesting for the very reason that it is essentially so deeply earnest. The sexual instinct is the kernel of the will to live, it is the concentration of all will, man is concrete sexual instinct." The sexual instinct of the philosopher, just as the more modern libido of Freud and Jung, is something which can only be adequately understood in a much wider context than that of the life of the individual. It is no mere gross somatic satisfaction; it has deep phylogenetic roots. The metaphysical needs of man, the creations of his religious feelings and conceptions can only be understood when their psycho-sexual roots are traced. The bipolarity of the sexual instinct has not been neglected by the philosopher and in this connection he has emphasised the relation between sexuality and crime. The influence of heredity is also referred to in clear and trenchant terms, and he insists on the necessity of keeping these facts in mind when framing penal statutes. How modern is his statement, "If one wish to consider prisons as educational institutions it is regrettable that admission into them is only possible through crime instead of the latter being obviated by them!" Juliusburger might well have studied the philosopher's views in relation to the circumstances of his own heredity, early development, and personal difficulties. As it is, he has contributed an extremely interesting chapter to the history of psychiatry.

C. MACFIE CAMPBELL.

**A STUDY OF THE SIGNIFICANCE OF THE HABIT-MOVEMENTS (199) IN MENTAL DEJECTIVES.** L. PIERCE CLARK and C. E. ATWOOD, *Journ. Amer. Med. Assoc.*, Vol. lviii., March 23, 1912, pp. 838-843.

THIS is a study of such habit-movements as finger-sucking, pelvic rocking, palm-rubbing, &c., in a large number of idiots and

imbeciles. In almost all of these cases masturbation made its appearance at puberty. The authors hold that these habit-movements are not mere acts of automatism, as has hitherto been held, but that they bear a very definite relation to the sexual development, or mal-development, of the defective. The theories of Freud are naturally quoted in support of their argument.

W. BOYD.

**THE FORMS OF MENTAL DISORDER OCCURRING IN CONNECTION WITH CHILD-BEARING.** G. CLARKE, *Journ. Ment. Sc.*, Vol. lxx., No. 244, Jan. 1913, p. 67.

THE author sums up as follows:—

(1) Almost any form of mental disease may be met with during pregnancy or lactation, but by far the commonest varieties are the acute confusional and the manic-depressive psychoses.

(2) In these two forms of mental disease the prognosis is as a rule good, but in other forms occurring at this time the outlook is not nearly so hopeful.

(3) Except in some cases of acute delirium, there is no reason to think that toxic or hæmic conditions are important factors; the mental breakdown may be looked upon as a temporary failure of the mind to adapt itself to physiological but unusual conditions.

W. BOYD.

**ON GLYCOSURIA IN MENTAL DISORDERS.** (Beitrag zur Kenntnis der Glykosurie bei Geisteskranken.) S. MITA, *Monatsschr. f. Psychiat. u. Neurol.*, Bd. 32, H. 2, 1912.

THE material consisted of 35 patients with depressed or anxious states and of 21 control patients. Out of the 35 patients of the first group, 8 showed glycosuria. Of these 8, 2 had neurasthenia, 2 had a hysterical psychopathic constitution, 2 had circular insanity, 1 patient had dipsomania, 1 melancholia (the author uses Ziehen's classification). In none of these cases was any of the usual symptoms of diabetes present and the amount of sugar in the urine was very small, varying from 1.05 per cent. to 0.01 per cent. Of the 21 patients of the second group sugar was only found once in the urine, in the case of an alcoholic with psychopathic constitution. The author concludes that there is a certain connection between glycosuria and a depressed affect independent of the actual clinical type of the disorder.

C. MACFIE CAMPBELL.

## Reviews.

**DIE APHASISCHEN SYMPTOME UND IHRE CORTICALE LOKALISATION.** Von E. NIESSL VON MAYENDORF (aus der psychiatrischen Klinik zu Leipzig). Mit 51 Figuren und VII Tafeln. Leipzig: Verlag von Wilhelm Engelmann, 1912. Pp. 454.

DR NIESSL VON MAYENDORF'S previous work on aphasia and its cortical localisation in various papers in the *Monatsschrift für Psychiatrie* is no doubt familiar to most neurologists. The handsome volume under review contains some 450 pages of clinical and pathological observations, both personal and culled from other sources, bearing on the question of aphasia in its differing forms, and therefrom are deduced certain conclusions which are not by any means always in harmony with what we are pleased to call the "classical theory" of aphasia: on the other hand, they are not in agreement with the recent pronouncements of Professor Pierre Marie.

Taking as the subdivisions of his material amnesia verbalis kinæsthetica, amnesia verbalis acustica, and amnesia verbalis optica, respectively, the author discusses these at great length from the points of view of symptomatology, diagnosis, prognosis, and cortical localisation, and incidentally indulges in various discourses into the debatable lands of transcortical and subcortical motor aphasia, Marie's teaching, transcortical and subcortical sensory aphasia, the functions of the lenticular nucleus, and so on, concluding with a chapter on certain cases of "Inselaphasie." He considers that transcortical motor aphasia is the product of restitution and though readily recognisable clinically, can scarcely be held to have a definite localisation. There is a long dissertation on the anatomical connections and functional significance of the lenticular nucleus, from which no definite conclusions are drawn, and in which certain views as to its relation with pontine nuclei are advanced, for which, in the reviewer's opinion, there is neither evidence nor even hypothetical justification. The author further states that there are important considerations militating against the view which regards the lenticular nucleus as exclusively motor, but it is clear that misconception exists as to the meaning of the term "motor," misconceptions which the recent work of Madame Vogt and others has to a large extent cleared away. Dr von Mayendorf concludes against attributing finality to Marie's opinions, and repeats various objections which have already been brought against them. One of the most important chapters in the book is concerned with the cortical localisation of ordinary motor aphasia, Broca's aphasia, which the author places in the lower third of the precentral gyrus and the pars opercularis. In their

course from the cortex downwards the motor speech fibres descend by the posterior part of the external capsule, and intermingle with pyramidal fibres in the posterior division of the internal capsule. A brief review such as the present does not permit of adequate discussion or criticism of this view, which, for that matter, is not unlike that advanced by Sir David Ferrier many years ago. It may be said, however, that it is a view which cannot lightly be ignored, for many data lend it support. The problematical significance of lesions of the cortex of the island of Reil is fully discussed, but here also no definite conclusions are drawn. There is a fairly large bibliography, but no index. Two charts similar to those already published by the author, in which the cortical superficies is mapped out and dotted with figures in colours to represent the lesions in recorded cases, are appended. There are a number of excellent half-tone illustrations of the sections in various cases of the author's reported in the text.

All students of the subject will do well to make themselves acquainted with the contents of this monograph. It contains an immense amount of information, handled methodically and logically. Many useful abstracts of apposite cases from the literature will be found scattered through its pages. Several original cases are reported in great detail, both clinically and pathologically. Dr von Mayendorf is to be congratulated on the scholarly fashion in which his labours have been completed, for the book is conspicuous, among a host of contributions to the subject, by reason both of its completeness and the ability that characterises it. There is, it may be remarked parenthetically, a curiously personal polemic in the book, unfortunately allowed to protrude at unexpected moments. The author apparently introduces all who happen to disagree with him with the prefix "Herr" to their names, and if he would be particularly scathing, this is elaborated to "Herr Dr — aus Berlin"! S. A. KINNIER WILSON.

#### **HANDBUCH DER NERVENKRANKHEITEN IM KINDESALTER.**

(203) Von Prof. L. BRUNS, Oberarzt d. Hannoverschen Kinderheilanstalt; Prof. A. CRAMER, geh. Med.-Rat., Direktor d. kgl. Univ. Klinik. f. psych. u. Nervenkrankh. in Gottingen.; Prof. TH. ZIEHEN, geh. Med.-Rat., fr. Direktor d. psych. u. Nervenlinik d. kgl. Charite in Berlin. Mit 189 Abbildungen im Text und 3 Tafeln. Berlin, 1913: S. Karger. Pp. 980. Price M. 30.

THE three distinguished German neurologists who have collaborated in the production of this volume of practically 1,000 pages on nervous diseases as they occur in childhood are regarded as authorities on the subjects with which they have dealt, and their names are guarantee of the thoroughness and comprehensive-

ness with which their task has been accomplished. The reader who glances through the book will readily discover that practically the whole range of neurology has been covered by the authors, and that there is little to distinguish it from a textbook of neurology so called, unless it be that diseases peculiar to childhood receive more attention than the others. We cannot help feeling, however, that the size of the book might have been reduced without loss of any material element. Professor Cramer devotes 40 pages to hysteria in children, 90 to epilepsy, and 40 to chorea. There is also a long chapter on tics. In spite of the amount of space devoted to these topics, we cannot find any adequate description of spasmus nutans, myoclonus, paramyoclonus multiplex, paramyotonus, variable chorea, and certain other allied conditions: some of these are referred to only in the briefest manner on page 527. Dr Cramer says he has never seen the reflexes altered in chorea minor, and does not allude to the occurrence of an extensor response in that affection. He recommends arsenic in the treatment of chorea, and uses aspirin, apparently, only where the heart is affected. It is the experience of English neurologists that in aspirin, apart altogether from cardiac complications, we have almost a specific in the therapeutics of chorea.

To Dr Bruns has been entrusted diseases of the spine and spinal cord, the varieties of muscular atrophy, and diseases of the peripheral nerves and plexuses. It is curious to find reproduced on page 261 Seiffer's scheme of the segmental distribution of the skin, for it has long been known to be both incomplete and inaccurate. The chapter on poliomyelitis contains much information and from the clinical standpoint could not be improved on: the reference to the most recent advances in our knowledge of its etiology and pathogenesis, on the other hand, are somewhat meagre. Dr Bruns believes that, apart from a specific morbid agent not yet recognised, poliomyelitis may in certain circumstances be caused by various other bacteria or their products, but we do not find any evidence for this view set forth. Among the special types of the disease there is no reference to acute cerebellar ataxia, and in Dr Ziehen's article on encephalitis only seven lines are given to it. Myatonia congenita is not given a chapter or section to itself, but is dismissed in a single paragraph on page 346, among the conditions from which poliomyelitis is to be differentiated. In the index the page is given as 247: the disease is again referred to (erroneously) as "myotonia congenita" on page 421, and three lines allowed for it. We mention these matters to save the reader the trouble which the reviewer has had in finding the disease, and to indicate the inadequacy of the space, in so large and pretentious a volume, allotted to it.

Dr Ziehen writes at great length on the diseases of the brain and meninges, and covers the ground with remarkable completeness. About sixty-five pages are given to the important subject of intracranial neoplasms, and this being so, we should have liked to see further details in the diagnosis of tumours of the temporal lobe; there is no description of the symptom-complex associated with the name of Hughlings Jackson and pathognomonic of lesions in the neighbourhood of the uncinate gyrus. There is no note of subjective visual disturbances in tumours involving the gyrus angularis. Disturbances of the pupillary reflexes in tumours of the third ventricle are by no means infrequent, are often of help in localisation, and might with advantage have been mentioned. The discussion of tumours of the pineal and pituitary glands is not sufficient, we think, for the importance of the subject, especially as such conditions are met with in children.

We have not offered the above criticisms in any carping spirit, for the volume as a whole is well calculated to take its place as a valuable work of reference. It is inevitable where there is collaboration that a certain amount of inequality should exist, but apart from that the merits of the book are very considerable, and we can recommend it to all who are concerned with or interested in the study of nervous disease in children.

S. A. KINNIER WILSON.

**EYE-STRAIN IN EVERYDAY PRACTICE.** SIDNEY STEPHENSON.  
(904) The Ophthalmoscope Press, London, 1913. Pp. 139. Price 3s. 6d.

DURING recent years an increasing amount of attention has been devoted to the connection between headache and other reflex neuroses and errors of refraction, and the present state of our knowledge of this subject is laid before the reader in an admirably concise and intelligible manner in this little book, which consists of seven collected papers by Mr Stephenson.

The author's judicious and moderate attitude is well reflected in the prescriptions given in the numerous instances quoted, for while stress is duly laid upon the fact that it is the cases presenting a low refractive error, associated with normal or supernormal vision, in which these neuroses are apt to occur, only a minute proportion of the prescriptions correct errors of a total magnitude as low as a quarter of a diopter, and nearly all of them more than this, corrections for microscopic errors being conspicuous by their absence. Our confidence in the author is still more firmly established by his sceptical attitude towards the views of those who would include affections ranging from appendicitis and tuberculosis to crime and insanity, as conditions referable to ocular troubles.



While one or two of the points mentioned are perhaps not yet beyond the realm of controversy, the book is one which should be read by all practitioners, and can be recommended with all the more confidence as it is short, well printed, and to the point.

H. M. TRAQUAIR.

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# **Review**

of

# **Neurology and Psychiatry**

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## **Original Articles**

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### **MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM: THEIR STRUCTURE AND HISTOGENESIS.**

By the late ALEXANDER BRUCE, M.D., LL.D., F.R.C.P.E.; and  
JAMES W. DAWSON, M.D. (Carnegie Research Fellow).

*(Continued from page 194.)*

#### **III.—THE GENESIS OF PERIPHERAL NERVES.**

##### **GENERAL REMARKS ON THE STRUCTURE OF THE PERIPHERAL NERVOUS SYSTEM.<sup>1</sup>**

ALMOST the whole of neuro-pathology rests on the neurone doctrine, which sees in the axis-cylinder a prolongation of a central cell. The problem of the relation of the nerve fibre to the nerve cell involves a consideration of facts relating to the continuity or independence of the central cell and its peripheral ramifications. The old reticular theory of Guerlach, who saw in the nervous system an uninterrupted protoplasmic network, was destroyed by the findings of Golgi in 1875 and Cajal in 1891. These observers, by specific staining methods, showed the existence of free terminations of the processes of the ganglion cells and of the axis-cylinder ramifications—a mere relation of contiguity of elements being thus indicated. In 1891 Waldeyer put forward

<sup>1</sup> Based on "Nerfs," by G. DURANTE, in *Manuel d'Histologie Pathologique*. Cornil et Ranvier (Paris), 1907.

the view that the nervous system is constituted of an infinity of anatomical units which, embryologically, are independent of each other. He proposed the term "neurone" to designate the cellular unit formed each of a ganglion cell, its nerve fibre process, and protoplasmic processes with their terminal ramifications. The simplicity of this view is greatly in its favour, for the *ensemble* constitutes a cytological unit developed from a single central neuroblast.

The conception of the cell-chain theory is opposed to the neurone doctrine. The nerve fibre, according to this view, represents a chain of special cells (segmental neuroblasts) secondarily brought into relation to the central cell. In each element there has differentiated from its individual protoplasm a fatty substance (myelin) and a fibrillated substance (axis-cylinder). Dogiel, Apathy, and Bethe have shown that the fibrils within an axis-cylinder can be related not alone to one ganglion cell but to several, and also to the peri-cellular network, and that, reciprocally, the network of a ganglion cell can be in relation to the fibrils of several axis-cylinders.

Durante, to whose work we desire to acknowledge our indebtedness, sees in this functional grouping of central and peripheral elements an analogy to a gland lobule. He proposes the term "neurule" to designate this physiological, polycellular *ensemble* a true primitive nervous lobule. The ganglion cell, charged not to create but to receive, perhaps to modify or accumulate, then to expedite the nervous impulse, is compared to a gland acinus. The segmental neuroblasts, charged to transmit from place to place this impulse to its destination, are compared to the excretory canals. In the neurule the elements have a reciprocal dependence in functioning, but may be individually independent (*e.g.*, in toxic or infectious conditions). This conception of a primitive nervous lobule allows of the nervous system being brought into line with other organs and simplifies the understanding of pathological lesions.

The neurone view teaches that the interannular segment of the peripheral nerve is composed of two distinct parts: one, the axis-cylinder, a prolongation of a central cell; the other, the rest of the segment, consisting of myelin sheath, sheath and nucleus of Schwann. The cell-chain theory teaches that the interannular segment represents a single complete cell element (*le neuroblaste*

*segmentaire*), whose protoplasm has elaborated *in situ* the differentiated substances, axis-cylinder, and myelin. The axis-cylinder is regarded no longer as a gigantic cell prolongation of central origin, but simply as a bundle of fibrils differentiated in each segmental cell, the myelin also being a product of the differentiation of the cell substance. The condensed outer layer of the cell substance forms the sheath of Schwann; the original nucleus, pushed to the periphery, lies in the thin zone of the remaining undifferentiated protoplasm. In the normal functioning nerve tube the differentiated substances preponderate greatly over the non-differentiated substance, but the former have, properly speaking, no life of their own and disappear in pathological conditions. The non-differentiated substance, on the other hand, represents the living element of the cell, and on it devolves the rôle of nutrition, defence, and reproduction; in pathological conditions it takes up its vegetative rôle, and the cell returns to its embryonic condition.

The normal histology of the peripheral myelinated nerve fibre, according to this view, is the following: In each nerve tube we recognise (1) axis-cylinder, (2) myelin, and (3) the sheath of Schwann, a thin membrane limiting the nerve tube on the outside; between it and the myelin lines (4) the nucleus of Schwann in a thin zone of undifferentiated protoplasm—normally scarcely visible. The myelin is interrupted at regular intervals at the nodes of Ranvier, and the portion of the nerve fibre comprised between two constrictions constitutes the interannular segment. Each segment contains usually only one nucleus and has the import of a highly differentiated cell.

The axis-cylinder is formed of two substances, conducting fibrils (the primitive fibrils of Apathy and Bethe) and interfibrillar substance (the axoplasm of Schiefferdecker). Between axis-cylinder and myelin is a thin zone of undifferentiated protoplasm, which Schiefferdecker regards as a periaxial lymph-space.

The myelin is composed of protoplasm of specific characters and is constituted by a network of neuro-keratin, whose meshes contain a phosphorised fat. The continuity of the myelin is broken by oblique notches arranged in an imbricated manner, the incisures of Lantermann, which stain by Strahüber's method similarly to the axoplasm of Schiefferdecker, and probably represent a portion of the undifferentiated protoplasm. Some observers, however, look upon both incisures and network as artefacts, others

regard them as a stage in the evolution of the nerve fibre—as they are much more evident in the early stages of development, and still others compare them to the canals met with in other cell protoplasms. According to Schiefferdecker and Durante, both incisures and network are present in the fibres of the central nervous system.

The sheath of Schwann is the thin condensed outer border of the protoplasm of the interannular segment. It is often difficult to distinguish it from the endoneurium which surrounds each individual nerve fibre. The nucleus of Schwann is the nucleus of the original cell lying in a thin zone of undifferentiated protoplasms in which, in early stages of development, fine granules, comparable to Nissl's granules in the nerve cell, can be recognised.

Remains of undifferentiated protoplasm are thus found in the interfibrillar substance of the axis-cylinder, in the periaxial zone, in the incisures of Lantermann, and in the perinuclear zone. It is the nucleus and this undifferentiated protoplasm which increase so greatly in pathological conditions.

A nerve trunk is surrounded by a connective-tissue envelope, the epineurium, and around each funiculus is the perineurium. The endoneurium passes between the nerve fibres of the funiculus, and its finest ramifications, lined by flattened endothelial cells, form round each nerve fibre a fibrillar network (the sheath of Henle).

Durante has also emphasised the complete analogy, according to this view, between muscle and nerve elements. The muscle fibre consists of (1) myoplasm—the fibrillar contractile substance—which is a product of the internal differentiation of the sarcoplasm, (2) the remaining undifferentiated sarcoplasm, (3) the sarcolemma, the condensed outer layer of the non-differentiated sarcoplasm, with (4) its peripherally placed sarcolemma nucleus in a thin zone of undifferentiated protoplasm. Under normal conditions the differentiated substance greatly preponderates over non-differentiated, but in pathological conditions the differentiated substance degenerates and the nucleus and non-differentiated substance take on a vegetative rôle and return to their embryonic condition.

#### (1) EMBRYOGENESIS.

Regarding the initial stages of the development of the peripheral nerves, there is far from any agreement amongst embryologists. At present three different theories hold the field, to

which Durante has given the names of central budding, cellular lengthening, and cell migration with the formation of cell-chains. Others have called them the outgrowth theory, the protoplasmic or intercellular bridge theory, and the cell-chain theory.

1. *Theory of Central Budding*.—Bidder and Kupfer, in 1857, put forward the view that the peripheral nerves develop by the budding of a central cell, whose prolongation—a homogeneous axis-cylinder without nuclei—reaches to the periphery and is only secondarily surrounded by mesodermic elements to form its sheath. His, Kölliker, and others have supported this view.

2. *Theory of Cellular Lengthening*.—In numerous animals we find at the limit of ectoderm and mesoderm certain elements possessing the characters of nervous and muscular elements. These neuromuscular cells become constricted in the middle, the part remaining in the ectoderm becomes sensory, the part remaining deeper purely contractile, and the protoplasmic bridge uniting them differentiates into a rudimentary nerve. This view is associated with the name of Hensen, and, with certain modifications, has been supported by Sedgwick, Held, and Graham-Kerr. Some of its supporters think that the cell connection is a secondary formation and is not due to an incomplete division, as Hensen believes.

3. *Theory of Cell Migration and the Formation of Cell-Chains*.—Balfour, Beard, Dohrn, Hoffmann, and others have demonstrated during the first days of embryonal development, especially in Selachians, the migration of neuroblasts from the nerve centres into the mesoderm. At the level of the lateral line of the neural tube it is possible to distinguish three kinds of neuro-epithelial elements. These three, primarily identical, are derived from the invagination of the dorsal epithelium, and later differentiate into cells each of which elaborates a specific substance: (*a*) ganglion cell—the neuro-chromatin granules, (*b*) glia cells—the glia fibrils, (*c*) neuro-formative cells or peripheral neuroblasts—the conducting fibrils. These last alone give origin to nerve fibres by migrating and in their further proliferation arranging themselves into uninterrupted cell-chains. The evolution of the nerve fibre according to this view shows three phases: fusiform embryonic cells, the union of these into long nucleated plasmodial bands, and the subdivision of these into segmented elements—the interannular segment.

It is necessary to note, firstly, that the supporters of the first

view do not deny the importance of the periphery in forming the path for the nerve fibres, and, secondly, that the supporters of the second view do not disclaim the influence of the ganglion cell upon the differentiation of the primary protoplasmic connections into nerve fibres.

Hensen (1864) thought that it was almost impossible to believe that the nerve filament found the muscle fibre without a guide. He supposed that the junction is effected early, whilst the two are in contiguity, and that the subsequent elongation of the nerve fibres is due to the change in the situation of the muscle. Primary tracts were thus laid down in the embryo which, later on, by some unknown process transformed themselves into nerve paths. Ranvier held that the axis-cylinder is uninterrupted from ganglion cell to periphery, but that it passes through a series of cells. His position, therefore, approaches Hensen's, and Gedoelst agrees with Ranvier's point of view.

His (1879-1886) describes the first rudiments of the nerve under the form of chromogen material, without nuclei, passing out from the spinal cord. He showed that special differential cells in the medullary tube—primitive neuroblasts derived from the *Keimzellen*—send out processes which form the anterior root-bundles, which, when they reach the limit of the medullary tube, are surrounded by mesenchyme elements that later penetrate the bundles. According to His, the spinal ganglia are not outgrowths from the medullary tube, but have at first no attachment to it. His and Kölliker state that the connection is established by the ganglion cells sending out processes which reach the cord. Before the attachment takes place the ganglionic *anlage* of each side divides into two portions, the spinal ganglion and the sympathetic ganglion. His did not definitely establish the precise origin of the *Keimzellen*.

Kölliker (1884) showed that the *Keimzellen* of His are derived from the original epithelial layer of the primitive tube, that these *Keimzellen*, through mitotic division, give rise to ganglion cells and glia cells, and that the fibres arise as non-nucleated processes of the ganglion cells and are continued as nerve fibres without any participation of cells in their course. By means of frontal longitudinal sections of the cord with developing nerves Kölliker has shown the naked compact bundles of nerve fibres. He states that the capsule cells of the spinal ganglia are mesodermic elements,

and that these grow into the ganglion and gradually surround each individual cell. It is to be noted that Kölliker in his last paper has admitted that the Schwann cells are ectodermic elements, and also that the growing nerve fibre at its tip is surrounded by a capsule of Schwann cells.

Balfour (1888), in *Elasmobranchs*, has shown that cells, migrating from the spinal cord, become arranged into spring-like groups with a wide attachment to the spinal cord. In these cells the nerve fibres develop. He remarks: "The cell structure of the embryonal nerve is a point on which I should have thought that a difference of opinion was impossible." Balfour was one of the first to note the structure which is generally called the neural crest. He also pointed out that the sympathetic ganglia arise as swellings on the posterior groups of the spinal nerves and soon become removed from the latter to form isolated masses.

Dohrn (1888-1892) has investigated the development of the nerves in *Selachians*, and states that the first rudiments of the nerve roots appear as protoplasmic columns uniting the spinal cord to the muscle segments before any differentiation of the cells of the early neural tube has taken place. In these protoplasmic columns were found numerous nuclei which Dohrn believed had migrated from the primitive medullary tube: the protoplasmic column later individualises into separate fusiform cells, which unite by their tapering extremities to form moniliform bands, and the protoplasm afterwards undergoes a differentiation into fibrils. The cells nearest the medullary tube fuse with the centrifugal process of the nerve cells in the cord. In this first stage there is no enveloping of the bundles by mesodermic cells; the latter penetrate later with the vessels and have no rôle in the formation of the nerve tube. V. Vijhe likewise considers that the nerve fibres are produced through a differentiation of the protoplasm of cell strands, which he, like Dohrn, saw extending from the cord to the muscle segments in *Selachians*. It is necessary to add that Dohrn, in continuing his work on *Selachian* embryos, saw appearances which he felt might be used for or against his previous views. The mesodermic elements lie so close to the emerging ganglion cell process that any distinction between the two is lost, especially as mesodermic cells predominate. Dohrn also thinks that an early penetration of mesodermic elements into the emerging zone of the motor fibres may have misled him.



Beard (1892), in embryos of *Raja batis*, has shown that the transient ganglion cells are the first-formed ganglionic elements from the neuro-epithelium, and that their nerves are mere transformations of chains of nerve-forming cells, *i.e.*, migrated ganglion cells. The motor end-plates are also derived from migrated ganglion cells. He also early noted the great resemblance between muscle fibre development and nerve fibre development. Beard has also shown that the lateral nerve in *Raja* is formed by a chain of nerve-forming cells arisen from the neuro-epithelium at the level of the lateral line, and that axis-cylinder and myelin are differentiated in these cells. He thinks that the histogenesis of motor spinal nerves simply repeats the history of such a nerve as the lateralis if the region which will become the anterior horn of the spinal cord be looked upon as the parent neuro-epithelium. The chain of cells leaves the cord in the same manner, and the terminal cells form the motor end-plates and must therefore also be looked upon as ganglionic in character. The attachment of the spinal ganglia to the cord takes place by a chain of undifferentiated ganglion cells from the spinal ganglionic *anlage* developing into nerve-forming cells. These short cell-chains reach upwards from the ganglion and form a continuous chain of several rows of cells along the route of the future posterior columns, and Beard's observations lead him to conclude that whenever a column or tract of fibres arises in the nervous system its development, as in this case, is initiated by the laying down of a chain of nerve-forming cells.

Apathy (1892-1907) believes that there is a primary differentiation of neuroblasts into central and peripheral groups; the latter migrate and develop into the nerve fibres, and the continuity between centre and periphery takes place later. Each individual cell, central and peripheral, consists, according to Apathy, of protoplasm and an intercellular differentiation of the cell protoplasm—the transmitting substance—fine fibrils.

Sedgwick (1895) has strenuously upheld the view that the mesenchyme is not a tissue of branched cells but a reticulum with nuclei at the nodes. He believes that the neural crest gives rise to nuclei, which spread out in the mesoblast reticulum, and that the nerves are developments of the reticulum, *i.e.*, that the nerves are, as it were, a gathering up into bundles of the reticular strands. The development of a nerve, therefore, arises from the differentia-

tion of a substance which was already in position, and this differentiation takes place from centre to periphery. The nerve roots are simply special enlargements of the connecting strands of the original reticulum joining the embryonic medullary wall to the general mesoblast reticulum. Sedgwick's position approaches, therefore, very near to that of Hensen.

Schaper (1897), together with Kölliker, was one of the first to prove the precise origin of the *Keimzellen* from the original epithelial layer of the primitive medullary tube. He further showed that these *Keimzellen*, by mitosis, give rise to nerve cells (neuroblasts) and indifferent cells, and that the latter may differentiate in very various directions, *e.g.*, into the cells of the granular layer of the cerebellum. Glia cells and peripheral neuroblasts may also arise from a further differentiation of the indifferent daughter cells of the primary cell groups. Schaper thought that in certain primitive conditions, *e.g.*, in amphioxus, the indifferent cells might possibly differentiate into nerve cells. Such indifferent cells may remain in an undifferentiated condition and later on might possibly play a rôle in regenerative processes in the central nervous system. This term "indifferent cells" has been largely used by later writers on the embryogenesis of nerves.

Kolster (1899), Gurwitsch (1900), Bardeen (1902) all agree that the first stage of the nerve bundle is an entirely non-nucleated one. Kolster chose as objects of study the embryos of *Salmo*, because here the first phases of development pass slowly. In *Salmo* the first *anlage* of the peripheral nerves is a narrow bundle of very fine fibrils proceeding from the spinal cord: the bundle shows no nucleus but pushes before it the layers of connective tissue, so that a single sheath covers the bundle. Later, the connective tissue cells proliferate and penetrate the bundle. Kolster stated that the first traces of myelin appear before any nuclei are present in the bundle, and that the myelin development progresses peripheralwards. The first myelin appearance within the central nervous system is likewise before the differentiation of the glia cells, when there is present only a framework of ependymal cells and processes.

Schultze (1904-1906) takes up a quite independent position. A pronounced supporter of the cell-chain constitution of the peripheral nerves, he holds also a modification of the protoplasmic bridge theory, for he denies the migration from the medullary tube.

Schultze's very extensive studies have covered the development of peripheral nerves in Amphibia, fowl, and mammal. His observations in a sheep embryo of 8 mm. show that the early motor roots consist of bundles of primitive fibrils converging towards the myotome, and that these are traversed by innumerable elongated nuclei. In later embryos only the distal end of the nerve shows many nuclei, and this end may split up into a brush of fibrils amongst which lie typical elongated nuclei. The picture is that of a syncytium, for cell limits cannot be recognised. Regarding the sensory nerves, Schultze states that below the corium in amphibian larvæ he finds a network of very delicate bipolar and multipolar cells with long processes continuous with nuclear rich nerve fibres. Here there is no fusion of individual cells into chains but a continuous sensory syncytium spreading over the whole surface of the body by the continued preservation of intercellular connections, following mitotic division of the nucleus. Schultze regards the nodal points as peripheral neuroblasts, and as he finds them beneath the skin in all mammals, he concludes that the whole nervous system in its specific elements is constructed out of millions of central and peripheral neuroblasts. This becomes clearer the further back we go in phylogeny, for the diffuse nervous system of the vertebrates and invertebrates, as far as it is known, consists of networks of cells and processes. This continuous integumental network of nerve-forming cells proves the analogy of the nervous system in all animals and gives the key to the understanding of the morphogeny of the nervous system from the Coelenterates to man. Schultze's very careful and exhaustive studies have convinced him that the present-day neurone teaching rests on no indisputable observation; that a right understanding of the nervous system in its ontogenetic and phylogenetic relations can be gained only on the ground of its cellular or syncytial structure from elements, central and peripheral, which are termed neuroblasts; that these elements are originally of equal significance and become partly central and peripheral ganglia or nerve cells, and partly elements which serve for the syncytial structure of the peripheral fibres, *i.e.*, peripheral nerve fibre cells. The chief point is that neuro-protoplasm does not grow out, but represents *ab ovo* a "continuum" formed by a few cells and their intercellular bridges. Whether the neuro-fibrils or the interfibrillar substance is the conducting part Schultze does not decide. In his latest

paper he states that the impetus to the formation of the neuro-fibrils may proceed from the central organs as from a dominating centre—proceeding peripheralwards into the performed syncytial channel.

Kohn (1905).—Kohn's researches into the development of the dorsal nerve root in mammals and the development of the sympathetic nervous system mark a distinct advance in our knowledge of the structure of the peripheral nervous system. After his work appeared even Kölliker and Lenhossek admitted the ectodermal origin of the sheath of Schwann cells. Kohn looks upon the problem of the origin of the sheath of Schwann cells as the crux of the question. If these were really acquired mesodermic elements, it would be impossible to defend the view that they have a share in the formation of the peripheral nerve fibre, but if they were of ectodermic origin the chief bulwark of the theory of the unicellular origin of the peripheral nerve fibre fell to the ground. It need hardly be said that the question is by no means settled, and distrust of the ectodermic origin, and specially of the nervous nature, of the Schwann cells is deeply rooted; and even those who admit their ectodermic origin, *e.g.*, Kölliker, Lenhossek, and Harrison, are still pronounced adherents of the outgrowth theory, and say that the ectodermic or mesodermic origin of the Schwann cells has nothing to do with the question whether the axis-cylinder is an outgrowth or not. Kohn, however, was not blind to the distinction between the problems of the origin of the sheath of Schwann cells and the development of the axis-cylinder, but he felt that a clear proof of the ectodermic origin of the cells in question would be a very strong argument in favour of their participation in the building up of the nerve fibre.

Kohn, studying the development of the dorsal nerve root in the rabbit embryo, found that the spinal ganglionic *anlage* is from the beginning in direct continuity with the medullary tube. At first this is only a protoplasmic connection which later develops into a cellular stem composed of the very same cells which form the ganglionic *anlage*. A further stage is the differentiation of the cells in the ganglion into more and more typical ganglion cells, and the cells of the stem into elongated tubes with oval nuclei which, as the nerve root lengthens, become more and more the typical cells of the sheath of Schwann with a differentiation of their protoplasmic substance into nerve fibres. Later on, and at

first sporadically, connective tissue penetrates the root. Therefore, from the cells of the embryonic *anlage* arise two types of cells, ganglion cells and nerve fibre cells. The Schwann cells of the posterior nerve roots, therefore, have not only an ectodermic origin but are of true nervous nature—nerve-forming cells. To give the name *Scheidenzellen* to such elements, Kohn considers a serious mistake, which has contributed greatly to their want of recognition as nerve elements. He suggests the name “neurocytes” for the early undifferentiated cells.

Kohn similarly traces the development of the sympathetic ganglia and its nerves to the migration of embryonal undifferentiated neurocytes to form the sympathetic ganglionic *anlage*. In the *anlage* these cells can be recognised to differentiate into sympathetic ganglion cells and nerve fibre cells and the latter to form nerve tubes. Before the characteristic ganglion cells have become differentiated, *i.e.*, while they are a-polar, the early nerve tubes appear as elongated band-like syncytia with numerous nuclei. The presence of ganglion cells in relation to cerebro-spinal nerves can thus be traced to the migration of embryonal neurocytes. It is thus seen that Kohn contests the view of the origin of the sympathetic ganglia directly from preformed ganglion cells cut off from the distal pole of the spinal ganglia. In the rabbit embryo, and also in Selachians, he has traced embryonal neurocytes bending ventralwards from the path of the mixed nerve. By their proliferation we get cell accumulations which form the *anlage* of the sympathetic cord, and by their further differentiation we get the ganglion cells and the nerve fibres of the sympathetic. The significance of this view in relation to the formation of ganglioneuroma will be discussed later. Froriep (1905) admits the ectodermal origin of the sheath of Schwann cells, but considers the axis-cylinders to be outgrowths of a central cell. In Selachian embryos he has been able to trace simultaneously the ganglion cell processes passing out as naked fibres, which then became covered with cells which have also emigrated from the wall of the medullary tube.

Lenhossek (1906) considers the question of the origin of the sheath of Schwann cells to be not immediately connected with that of the mode of formation of the axis-cylinder. Though a convinced centralist, he derives the Schwann cells, which he terms lemnoblasts, from the spinal ganglionic *anlage*. In the fowl

embryo and in a very early human embryo he has shown that the cells of the spinal ganglionic *anlage* differentiate into ganglion cells and cells which pass along the nerve root as sheath of Schwann cells, but that these latter do not form the fibres of the sensory root. The lemnoblasts thus correspond to the glia cells of the central nervous system. Lenhossek's illustration of the glosso-pharyngeal nerve with its ganglion, corresponding to a posterior root ganglion, shows that through the whole extent from the ganglion to the medulla the bundle of fibres is entirely non-nucleated but is ensheathed by a single layer of cells, whose nuclei are quite distinct from the surrounding mesenchyme elements. Later, cells, proliferated and migrated from the side of the ganglionic *anlage*, penetrate both motor and sensory roots, and future lemnoblasts are formed by an independent increase of those already penetrated. He believes that the spinal ganglionic *anlage* provides the sheath of Schwann cells for the whole peripheral nervous system, including the sympathetic. Lenhossek says that the supporters of the cell-chain theory cannot get over two facts: the one, the absolutely non-nucleated condition of the white substance of the central nervous system; the other, the almost non-nucleated condition of the peripheral nerves in certain stages of their development. Lenhossek admits that it is conceivable that under pathological conditions the sheath of Schwann cells, in virtue of their origin from the neural crest, may become nerve builders.

Bethe (1906), whose work on the regeneration of nerves we shall refer to later, endeavours to answer Lenhossek in the following terms: The first *anlage* of the peripheral nerve consists only of a cell syncytium with nuclei arranged as a border; later, the nuclei of this syncytium proliferate and penetrate the protoplasm, giving rise to cells arranged in rows, and in the protoplasm of these cells the first axis-cylinders form. Bethe argues that the developing nerve is just as little non-nucleated as the cylindrical epithelium of many gland tubes, and that Lenhossek and others have used methods which revealed the axis-cylinders but not the development of them within the cells.

Held (1906).—No review of the work on the development of nerves can afford to ignore Held's important memoir and later papers founded on an exhaustive investigation of the embryos of trout, shark, frog, rabbit, &c. It is almost impossible to give

an abstract of his views. They are so far a modification of Hensen's that they are referred to as the Hensen-Held hypothesis, which may be stated thus: (1) The cells related to an embryonic nerve path are (a) neuroblasts of His, which form the neuro-fibrils and drive them forward, (b) conducting cells (*Leitzellen*), in the interior of which the neuro-fibrils pass. (2) The neuro-fibrils, which arise in the fibrillogenous zone of the neuroblasts, are continued into the interior of a system of pre-existing protoplasmic bridges, represented in the central nervous system by the network of the spongioblasts and in the mesoderm by the anastomosing expansions (plasmodesmata) of star-shaped conducting cells (*Leitzellen*). (3) These *Leitzellen*, which may possibly be of ectodermic origin and have the function of nourishing and protecting the axons, would become ultimately the cells of the sheath of Schwann: yet they are not capable of producing the neuro-fibrils. (4) In the earliest stage a nerve is non-nucleated; the primitive neuro-fibrils are enveloped in a granular neuroplasm which forms a broad and entirely non-nucleated zone. (5) The process of neuro-fibrillation is an intraplasmatic progression from the neurogenetic centre. (6) There scarcely exists any neurone independence, for the neuro-fibrils of one neuroblast penetrate into the interior of other neuroblasts, producing a diffuse network.

The Hensen-Held hypothesis, therefore, is opposed to the unicellular genesis of the nerve fibre and the neurone teaching of the genetic unity of the ganglion cell and its ramifications, but it agrees with His in looking on the neuroblasts as the chief participators in the formation of the nerve path, *i.e.*, from them proceeds the genetic impulse for the formation of nerve tissue. If we have read Held aright, he does not seem to have decided whether the neuro-fibrils formed in the initial nerve path by the neuroblast go on being formed progressively by their influence on the plasma of the intercellular bridges, or whether the neuro-fibrils grow out within the plasma of the intercellular bridges by the driving forward action of the neuroblast.

Cajal (1907).—The classical illustrations in all modern textbooks of the development of the embryonic nerve fibre are taken from Cajal's works, and Cajal's views are too well known to need any detailed statement. His has had no more loyal and convincing supporter than Cajal, whose beautiful silver preparations have conclusively proved to so many that the developing nerve

fibre is the result of the continuous outgrowth of the principal prolongation of the neuroblast of His. Cajal has shown that this prolongation has a free thickened end (*cône de croissance*) which glides between the cell interstices. This intercellular progression, in contrast to Held's intraplasmatic progression, takes place both in the interior of the embryonic nerve tube and in the depths of the mesoderm. The primary axon and the terminal cone have a neuro-fibrillar structure with an unstained neuroplasm and a fine limiting membrane. He has further shown that the *cônes de croissance* are entirely naked in their passage across the perimedullary space. The first axons emigrating into the mesoderm are isolated, the latter are in intimate relation to one another. The adventitial cells (*Leitzellen* of Held, lemnoblasts of Lenhossek) are always between the bundles. To explain why the nerve fibres traverse the mesoderm and also their relation to the myotome and epithelium, Cajal finds it necessary to suppose the existence of specific chemiotactic substances, secreted by the myotome and the epithelium, which excite the amoeboidism of the cone of growth. As early as 1892 Cajal had compared the *cônes de croissance* with their terminal filaments to nerve pseudopodia which have amoeboid movement and a certain impulsive force.

Cajal explains Held's pictures of the penetration of the terminal cone into the interior of cells of the cord and mesoderm (plasmodesmata) as due to the shrinkage of the tissue and the agglutination of the embryonic axons to the tissue elements. He thinks that Held's view simply places the question of the orientation of the nerve paths and the peripheral connections on new ground. "Au point de vue de cette théorie, la question se réduit à ces termes: en vertu de quelles conditions physico-chimiques se sont produits, dans certains endroits de l'embryon et avant l'apparition des axones, des chemins directs et parfaitement congruents entre tous les organes qui doivent ultérieurement contracter des connexions anatomiques et fonctionnelles?"

Harrison (1905-1910) thinks that the attempt to answer the question of the development of nerves in normal embryos has been largely a matter of individual interpretation. He has therefore carried out a series of valuable investigations, along the line of experimental embryology, to eliminate all possible sources of error in coming to a conclusion as to the relation of the nerve fibres to the nerve cells. By his final work he claims to have conclusively



established, on the basis of direct observation, the His teaching of the outgrowth of the nerve fibre from the central neuroblast.

Harrison's earlier embryological researches had led him to the conclusion that the sheath of Schwann cells arise from the neural crest, and, taking this as the starting-point, he tried first to answer the question of the source of the elements of the nerve fibres. In amphibian larvæ, before any differentiation of nerve cells and fibres has occurred, he removed the source of the sheath of Schwann cells, *i.e.*, the ganglion crest, and found that the motor nerves developed as naked fibres without sheath cells. Harrison then removed the source of the motor nuclei—*i.e.*, the ventral half of the cord, leaving the dorsal portion of the cord and the ganglion crest—in order to answer the question: Can sheath cells without ganglion cells form the nerve fibres? The result was that sensory fibres and sheath cells appeared but no purely motor rami. Therefore, sheath cells by themselves cannot form fibres, and ganglion cells by themselves can form naked axis-cylinders.

Harrison next set himself to answer the question: What are the factors that influence the laying down of the nerve paths during embryonal development? Is the nerve fibre a product of the ganglion cell, or formed *in situ* in the peripheral path? He therefore first removed portions of the nerve centres and found that no peripheral nerve developed in relation to the absent ganglion cells. The second step consisted in the transplantation of undifferentiated portions of the nerve centres to abnormal positions of the embryo body, with the result that they gave rise to nerve fibres which followed paths in which normally no nerves were present. He concluded, therefore, that the nerve fibre is a product of the ganglion cell and not a mere activation of indifferent extra-ganglionic substance. In order to confirm this observation Harrison carried out a further series of experiments. Braus and Bianchi had previously transplanted buds of larval extremities, in which there were no nerves at the time of transplantation, and had found nerves developed autochthonously with no connection with the nerves of the host. Similar experiments carried out by Harrison and Lewis led them to the conclusion that nerves are not formed *in situ* in the transplanted limbs, but grow into them from the nerves of the host, and that there is no evidence that any specifically formed or localised structures, essential to the formation of nerve fibres, are present.

Harrison's final step was to answer the question: Is the nerve fibre entirely the product of the nerve centre? He recognised that in all his former experiments the nerve fibre had developed in surroundings composed of living organised tissue which might possibly contribute organised material to the nerve elements. He initiated, therefore, what he describes as a really crucial experiment. This consisted in the placing of pieces of embryonic tissue, taken before any histological differentiation has taken place, in hanging drops of clotted frog's lymph, and keeping the sealed preparations under observation for a number of days. The cells when taken were rounded, without any sign of differentiation, and were found soon to manifest amœboid movement—resulting in the formation of long threads of hyaline protoplasm with free filaments, which continually change their form and are exactly similar to the pictures by Cajal in normal embryos. It is to be noted that cilia of neighbouring epidermic cells remained active and embryonic mesoblast cells became transformed into striated muscle fibres, so that there was no doubt that even under artificial conditions life and growth and differentiation were continuing. The development of the nerve fibre is thus brought about by one of the primary properties of living protoplasm common to all cells—amœboid movement, and Harrison points out that he had substituted for the supposedly-essential protoplasmic bridges only unorganised fibrin threads which could afford merely a mechanical support for the growing nerves. The elementary factors in nerve development are therefore two—the one, protoplasmic movement, the other, the differentiation of this protoplasm by the formation within it of neuro-fibrils.

Held and Harrison differ as to the source of the protoplasm within which the neuro-fibrils develop. Held believes that it is formed of cells scattered all through the embryonic body: Harrison that it flows out from the central cells and thereby establishes the path in which the necessary fibrils are formed. It is this laying down of the path by means of a form of protoplasmic movement, rather than the process of differentiation into neuro-fibrils, that constitutes the problem in the development of nerves.

Carpenter and Main (1907), in pig embryos, have traced cells which migrate from the medullary tube, pass into the ventral nerve roots, and form the sheath cells. Kuntz (1909), also in pig embryos, has made similar observations in relation to both ventral

and dorsal roots. He states further that these migrated cells pass along the spinal nerves and ventral rami to form the *anlage* of the sympathetic ganglia. All these writers refer to the cells as the "indifferent" cells of Schaper.

Graham-Kerr (1910) has emphasised the necessity of selecting suitable material, so that one does not become lost amongst the details of observation. He chose the *Lepidosiren* on account of the coarseness of its histological structure and the size of the cell elements. He has come to the following conclusions: that the motor nerve trunk is already present as a protoplasmic bridge, placing spinal cord and myotome in organic continuity, at a period so early that these structures are in immediate contact, thus placing His's outgrowth theory out of account; that this protoplasmic nerve trunk, at first merely granular, gradually assumes a fibrillated structure; that the at-first naked and non-nucleated nerve trunk acquires a sheath, the heavily yoked material of whose protoplasm demonstrates it to be of mesenchyme origin; that if the conception of units is to be used as a working hypothesis, the unit should be the complex consisting of nerve cell, nerve fibre, and muscle cell—a myo-neurone; and that all the possibilities seem to point to the nervous system having become evolved out of a sub-epithelial plexus of the type which still persists in Coelenterates. The facts of development in *Lepidosiren* thus give strong support to the protoplasmic bridge theory.

Graham-Kerr looks upon the differentiation of the neuro-fibrils from the physiological standpoint, and regards their specialisation in structure to be correlated to the repeated passage of impulses along them. Each particular impulse as it is repeated between a central cell and its end cell beats out, as it were, its own special pathway. This we term a neuro-fibril. Referring to the recent work of Harrison, he asks if these experiments have really the finality which is claimed for them, and suggests the question: Has Harrison excluded the possibility that the excised fragments of the embryonic spinal cord included the nerve trunk rudiments? He thinks that they simply prove that the young nerve grows in length—a self-evident fact quite independent of any particular theory.

## NOTE ON THE GENESIS OF NERVE FIBRES IN THE CENTRAL NERVOUS SYSTEM.

Most of the observations upon the origin, development, and structure of nerve fibres have been made upon the peripheral nerves. The fibres of the central nervous system are described as having no cells either as sheath cells or in any way related to their course. Up till recently the theory that each nerve cell and fibre in the central nervous system was developed from a single unit was generally accepted. Many writers have indeed asserted that it is inconceivable that the fibres of the central nervous system can have any cells in relation to them except the central cell of origin. This has been one of the strongest arguments of the centralists, that the peripheral nerve fibre also had arisen solely from a central cell. Fragnito, Capobiancho, and others, however, have recently brought forward evidence in favour of the multicellular origin both of the nerve cell and central nerve fibre.

Capobiancho (1904), in kitten embryos and in the human foetus at the third month, has described successive stages in the development of nerve cells from the neuroblasts in the cord and spinal ganglion. The small groups of neuroblasts become approximated, their protoplasm fuses into a single mass, and certain of the nuclei undergo regressive changes and finally disappear. Not only the body of the nerve cell but also its processes are formed by this fusion of neuroblasts.

La Pegna (1904) has used chiefly Cajal's and Donaggio's staining methods for neuro-fibrils. He supports the view of the independent origin of nerve fibres and nerve cells. His conclusions are as follows: The nerve cell does not take part in the formation of the nerve fibre; the nerve fibre in the first stage of its development has no connection with the nerve cell; the peripheral and central nerve fibres are developed from cell-chains; the protoplasmic processes, like the axis-cylinder processes, are also derived from cell-chains; and the neuro-fibrils of the nerve cell are a late product of differentiation—in the chick they do not develop before the tenth day of incubation.

Fragnito (1905), in the chick embryo, has given a description of the genesis of the central nerve fibre from chains of nucleated cells. By the use of Donaggio's intracellular fibril method he was able to follow the disappearance of the nuclei, and the formation

of the neuro-fibrils. The fibre resembles a ribbon or thread with fusiform swellings at regular intervals. It is inferred that each swelling of the thread represents a cell, whose nucleus is quite evident, and whose protoplasm is elongated into two filaments which unite with the filaments of two contiguous cells. The nucleus tends gradually to disappear, and probably its substance is diffused into a protoplasm, and transformed into the axis-cylinder. In the cells of the same thread the nuclei are seen in various phases of transformation, and as they fade the fusiform swellings disappear, and the margins of the thread tend to become parallel. Fragnito agrees with La Pegna that the axis-cylinder is never seen in connection with the nerve cell before the tenth day. This differs from the observation of Cajal, who states that by the fifth day all the axis-cylinders have reached their destination, and can be traced emerging from the cord by the anterior roots as well-formed tubes of white matter.

Cantelli (1907) has examined the structure of the neuro-fibroblasts in the central nervous system of the chick by means of Donaggio's neuro-fibril method, and subsequent staining with neutral red. There were found in the spinal cord long bands with uniform spindle-shaped swellings, in the middle point of which were dark granules: these granules stained intensely with the nuclear stain, and were thus taken to correspond to nuclear substance.

Hardesty (1905), studying the developing spinal cord of the pig, noted the presence of half-moon or signet-ring-shaped cells encircling the nerve fibres. In early stages the axis-cylinders run as fine fibrils in a syncytium in which nuclei lie. During the period at which the process of myelination is at its height, these are distinct cells with considerable protoplasm lying in relation to the developing nerve fibres. The protoplasm of the cells at first often completely encircles the growing myelin sheath, but with its further growth the protoplasm of the cells is used up. It is suggested that the signet-ring cells represent elements derived from the syncytium, and the protoplasm represents endoplasm which is gradually transformed into exoplasm, which in its turn is transformed into the lamellated reticulum of the central nerve fibre by a process similar to that described in the development of connective tissue fibres. The signet-ring cells, therefore, diminish in number and size with the age of the embryo, and

later can scarcely be distinguished, even if present, from flattened neuroglia cells.

Barile (1910) records the investigations of Paludino in *Trygon violaceus*, in which he found nuclei in relation to the axis-cylinder within the spinal cord, and also the examination of a teratoma from the neck in which Niosi found a nodule of the structure of the central nervous system, with the axis-cylinders developing in relation to a chain of cells.

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(*To be continued.*)

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## A CASE OF CEREBRAL SYPHILIS OCCURRING SIX MONTHS AFTER THE INITIAL LESION.

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(With Plates 19 and 20.)

SUCH eminent authorities as Lannois, Fournier, Mingazzini, Oppenheim, Nonne, Gowers, and others have reported and seen cases of cerebral syphilis which developed from one and one-half months to one and one-half years after the appearance of the initial syphilitic lesion. The interesting investigations of Rumpf and Nauyn show that during the early period of luetic infection the nervous system may be affected. Nauyn examined 335 cases (45 his own cases, and 290 from the literature), and demonstrated that 48 per cent. of these cases developed cerebral manifestations during the third year, and from that time the frequency of cerebral syphilis gradually and proportionately diminished from year to year.

Gilles de la Tourette reported a case of severe syphilitic infection of brain and cord two months after the appearance of the chancre. Fournier recorded a case of cerebral syphilis—right-sided hemiplegia—which developed two months after the initial luetic ulcer. Kreibrich's case manifested cerebral affection four months after the infection.

Nonne, in his book, describes three cases; the first was one of basal meningitis, occurring four months after the infection, and at that time the patient presented a papular eruption. The second case was that of a 24-year-old corporal, who became afflicted with cerebral syphilis four months after the infection, and seven months



later death occurred. Autopsy showed a gummatous basal meningitis, endarteritis, and hardening of veins. The third case was that of a young woman, who during the secondary stage of syphilis presented the picture of a cerebello-pontine angle tumour. Jolly's case developed a hemiplegia with total aphasia eight months after the syphilitic infection. Quinke's patient, four months after contracting lues, displayed a picture of myelitis and meningitis, and in a few days death occurred. Post-mortem examination confirmed the diagnosis of cerebro-spinal syphilis. Collins and Taylor reported a case of a young man who, four months after luetic infection, suffered from syphilitic involvement of the cord, which was demonstrated post mortem. Stursberg's patient during secondary syphilis presented definite cerebral symptoms, such as headache, vomiting, eye disturbances, right-sided hemiplegia, &c., and the post-mortem findings corroborated the clinical diagnosis of cerebral lues.

The following is a complete record of our case :—

*The patient, Hungarian Hebrew, about 20 years of age, was admitted to the Psychopathic Ward of Bellevue Hospital, 6th October 1912. He contracted syphilis in the early part of May 1912, and six months later a right-sided hemiplegia with motor aphasia developed. Under active anti-luetic remedies a marked improvement resulted.*

*Family History.*—There is no neurotic or vesanic taint in the family or its collateral branches.

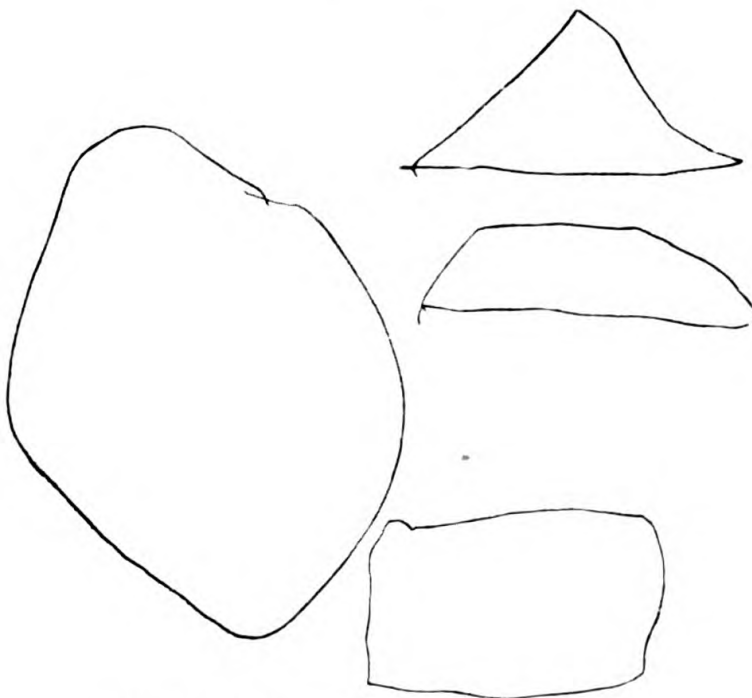
*Personal History.*—The patient is 20 years of age and a native of Hungary. Nothing is known of his early childhood. He immigrated to the United States of America eight years ago; here he pursued various occupations, that of bell-boy, elevator runner, chauffeur.

He was of temperate habits, but smoked to excess. He was quiet and even-tempered, fairly intelligent, and was much liked by his associates and employers.

In the early part of May 1912 the patient had two chancres on his penis; one was soft and appeared three days after intercourse, the other was hard and developed one week after coitus. 3rd June 1912, he came under treatment by Dr Bernard Weiss, to whom we are indebted for this history. At that time he had enlarged glands of his groins and there were a few papules on the abdomen, chest, and back; 18th June 1912, the secretion



PHOTO II.—Showing the Right Nasolabial Fold.



Copying of Geometrical Figures (Dec. 1912).



From October

In going in  
(I like to walk)

Mama now  
(I like mamma)

Mamsture } name  
Green

Wat = cat

Boys (men) D  
Egloord  
Boys (men) (eyes)

from the ulcer was examined, but no *Spirochetæ pallidæ* were demonstrated; 29th June 1912, papules appeared all over the body and the mucous membrane of the throat was congested; the glands in the groins were still enlarged; 1st July 1912, the Wassermann test of the blood serum was positive. At that time active anti-syphilitic treatment was instituted. Soon the eruption began to disappear and the patient began to improve. However, towards the end of July, the eruption reappeared, and the patient looked "haggard and worn out." He admitted that he drank to excess for a few days, and ate very little (this is the only history we have of the patient indulging in alcoholic excesses; the friend who gave us the history said that he was of temperate habits).

Our informant, the patient's friend, stated that he saw the patient two weeks prior to his admission to Bellevue Hospital, and that at that time he enjoyed good physical and mental health. He emphasised the fact that only three days before his coming under our observation the patient began to complain of headache and grew lethargic. Weakness of the right side of the body and inability to speak developed thirty-six hours previous to his admission to the hospital.

Upon admission to the Psychopathic Ward, the patient was dull and drowsy; he answered few questions; his comprehension was dull and sluggish. The right side of his body was partially paralysed; within a day he became completely paralysed and aphasic.

A complete status was taken, and the following is a brief synopsis of the examination.

The patient was well developed, and his general nutrition was fairly good; a papular eruption all over body, especially the upper and lower extremities, was observed. There were no mucous patches or enlarged glands. The temperature was slightly elevated; the pulse was of fairly good volume and tension; the visceral organs were without disease.

The ocular muscles were intact. The pupils were unequal and slightly irregular in outline, especially the right; the left pupil was smaller than the right; both reacted to light and on accommodation sluggishly, particularly the right one. The right side of the face was paralysed, the naso-labial fold was obliterated. The tongue deviated to the right. Hearing was good. The corneal and conjunctival reflexes were intact. The right side of



PHOTO I.—Showing the Patient in a standing posture and raising his right arm.

PHOTO III.—Showing the Patient in a standing posture on one leg and raising the right thigh and leg.



the body was paralysed. Pain sense was diminished on the affected side. There was a clonus and Babinski phenomenon on the right side; the knee and Achilles jerks were unequal and somewhat exaggerated, the right greater than the left. The reflexes of the right upper extremity were more active than those of the left. The abdominal and cremasteric reflexes on the right side were absent. The patient was unable to assume a standing posture, nor was he able to sit up. He remained lying in bed, and required constant care and attention. He was nauseated, and at times vomited a greenish fluid, and complained of headache.

Mentally he was dull and drowsy; occasionally he was fidgety and inclined to be restless; under examination he would become easily fatigued. He was unable to speak, but at times carried out a few simple commands; occasionally perseveration of movements was noted. He was unable to name objects as they were shown to him. When asked to repeat the sentence, "I like to walk," he uttered a few indistinct sounds in a nasal tone. On account of inaccessibility finer tests for aphasia were unsuccessful.

The Wassermann test of the blood and cerebro-spinal fluid was completely positive. There were 618 lymphocytes per cubic millimetre, and globulin was much increased.

The patient was put on anti-luetic treatment (salvarsan and neo-salvarsan intravenously, potassium iodide in increasing doses, and mercury sublimate intramuscularly), and following the first intravenous injection of salvarsan the patient began to manifest a marked improvement, which has been gradual and progressive. He became bright and cheerful; he evinced interest in his environment, was able to understand what was said to him, but could not speak until 15th November 1912, when he suddenly uttered a few words; since then his speech has gradually improved.

His present condition (17th December 1912) is as follows: The patient has made marked improvement, both mentally and physically. He has gained in weight; his appetite has been excellent and his sleep has been undisturbed. He is able to walk without assistance, but he drags his right leg; he can stand without being supported (*vide* photo 3); he is able to raise his right arm (*vide* photo 1); however he cannot flex his right arm or move his fingers on the right hand. The naso-labial fold is fairly active (*vide* photo 2), but the tongue still deviates to the right.



The pupils are slightly irregular in outline, but react to light and on accommodation very well. Recently Dr Charles May re-examined the patient and found that the optic neuritis, which was previously present, had disappeared. The pain sense on the paralysed side is slightly diminished, and the thermal sense is affected inasmuch as the patient frequently mistakes cold for hot and *vice versa*. The muscle and light touch sense is normal. The reflexes on the right side of the body are exaggerated, and there is a knee and ankle clonus; Babinski phenomenon is not demonstrable; the right abdominal and cremasteric reflexes are absent. Co-ordinated movements show no defect.

Mentally the patient is cheerful and optimistic; he evinces active interest in the general affairs of life; he takes out-door exercise; and his general conduct is fairly natural. He is very well oriented, and memory and retention show no impairment. The following answers to questions will serve as illustrations:—

How do you feel? I feel all right.—Are you happy? Yes, sir.—Why? You gave me all my life.—How is that? By putting five times “606.”—How is your head? All right.—How old are you? 21.—Where were you born? Austria.—How long have you been in the United States? Ten years.—How old were you when you came here? Eleven years.—Did you come alone? Yes, sir.—Have you a father? Yes.—Have you a mother? Yes.

He knows the day, month, and year; he knows how long he has been here. 6 times 6 is 36; 9 times 9, I don't know; 7 times 7, I don't know; 4 times 4 is sixteen; 5 times 5 is 25; 4 and 9 is 13; 13 and 7 is 20; 17 and 18 is 35.

An aphasic status<sup>1</sup> was again taken, which revealed that there is a marked defect in the patient's spontaneous speech; he is unable to give a long account of himself; in attempting to tell how his illness developed he becomes incoherent, a few paraphasic expressions are noted, and at times he mispronounces a few words. The following is a specimen:—

How did you get sick? Yes—yes—doctor, I got sick that way—I got sick that way three months—I got sick when I went to doctor—er-er-er—on 79th Street and 3rd Avenue. Doctor he tell me—all right—you got a chancre. I will have to cure you—six weeks to get cured. I went six or seven weeks to get cured. I got a chancre doctor tell me. No, but you have to go—er-er-er—

<sup>1</sup> According to Professor Adolf Meyer's outline of aphasic examinations.

at the Hospital—16th Street Hospital—I went there—like my—get cured.

And—er-er-er—three days (patient snaps fingers)—er-er-er—three years—but he is going to get his “blut” cured; doctor—er—tell me, is it for me. (Interrupted by stenographer.) No, not for me, for you (laughs). Doctor, I went that time for a job—chaffeur—er-er—now I don’t know.

One could readily see that he laboured to find necessary words to express his thoughts. He tried several times to give the alphabet in consecutive order, but failed to do so. He gave the months correctly. He was able to count from one to sixty-four, but in going from twenty to one, he went as far as nine only.

He carried out simple commands promptly, and Marie’s test was well performed. He could repeat simple sentences. He was able to pick out objects, but at times had difficulty in naming things. However, when his attention was called to the error, he recognised it as such. He could read words and simple sentences, and carried out simple written commands. He could also recognise a few symbols, such as U.S.A., U.S.M., Y.M.C.A.<sup>1</sup> He wrote with his left hand, but his writing was unintelligible; he could copy a few drawings correctly (*vide* specimens). There was no apraxia or asymbolia.

The Wassermann test in the blood is now weakly positive; there are only 17 cells per cubic millimetre; and globulin according to Noguchi’s method (formerly the Kaplan method was employed) is normal; the Wassermann reaction in the cerebro-spinal fluid is still positive. The following diagram will show the relation of the Wassermann test, cytological and chemical content of the cerebro-spinal fluid to treatment:—

<sup>1</sup> Internal language intact.

19th Oct.	19th Oct. to 6th Nov.	6th Nov.	6th Nov. to 29th Nov.	29th Nov.	29th Nov. to 18th Dec.	18th Dec.
Lymphocytes, 618 per cm. Globulin <sup>1</sup>	Potassium iodide, 2.451 gr. Mercury salicy., $\frac{1}{4}$ gr. Salvarsan, 1.2 gm., and neo- salvarsan	Lymphocytes, 78 per cm. Globulin <sup>1</sup> Wassermann cere- bro-spinal fluid, positive Wassermann blood, positive	Potassium iodide, 3,900 gr. Mercury salicy., $4\frac{1}{2}$ gr. Neo-salvarsan, 0.6 gm.	Lymphocytes, 26 per cm. Globulin <sup>1</sup> Wassermann cere- bro-spinal fluid, positive Wassermann blood, positive	Potassium iodide, 1,500 gr. Mercury salicy., $5\frac{1}{4}$ gr. Neo-salvarsan, 0.6 gm.	Lymphocytes, 17 per cm. Globulin, normal <sup>2</sup> Wassermann cere- bro-spinal fluid, positive Wassermann blood, weakly, positive

<sup>1</sup> Kaplan method.<sup>2</sup> Noguchi method.

## EPICRISE.

The fact that we are dealing with a case of cerebral syphilis cannot be disputed. The positive history of syphilis, the complete laboratory report, and the development and course of the clinical picture, will all speak in behalf of this diagnosis. The underlying pathological process is most probably one of acute exudative meningitis, with either thrombosis or endarteritis of the lenticulo-striate arteries. The former expressed itself in headache, nausea, vomiting, drowsiness, stupor, optic neuritis, and a marked lymphocytosis of the cerebro-spinal fluid; the latter would explain the right-sided hemiplegia and motor aphasia. Erb, in discussing the pathology of cerebro-spinal syphilis during the first and second stages, remarks: "The changes in the nervous system during the first and second stages of syphilis are not very well known, although the clinical manifestations during these stages are ob-

served. It is believed that various irritative processes may occur, perhaps in the form of serous exudation and diffused infiltration, which are mostly absorbed without leaving any traces, and occasionally thickening of the tissue may be the only residual. However, according to Schmaus, one thing may be frequently present in the early stages, that is, a marked pathological process of the blood vessels, perhaps also meningitis."

Evidently in our case the luetic infection was virulent in form, inasmuch as the first symptoms appeared one week after exposure, and the cerebral affection developed six months later. In this connection it would be interesting to call attention to Dreyfus' studies of the Wassermann tests, and of the cytology and chemistry of the cerebro-spinal fluid in secondary syphilis. He was able to demonstrate in a large majority of his cases a pathological condition of the fluid; in 17 out of 22 cases the cerebro-spinal fluid showed either a lymphocytosis or an increase of globulin content, and in five instances the cerebro-spinal fluid was under high pressure. It is necessary to emphasise the fact that in none of these cases did the nervous system show any evidence of organic disease, and, moreover, his patients were not treated with anti-syphilitic remedies. He refers to the following interesting case:—

Prostitute, age 23, was admitted to Cologne General Hospital. November 1911; at that time she was treated for gonorrhœa; a Wassermann test was then made, which proved to be negative. In January 1912 she contracted syphilis; a month later a maculopapular eruption appeared all over the body. However, there were no objective or subjective signs of affection of the nervous system. He gives the following diagram, which illustrates the relation of salvarsan to the Wassermann test and the other findings in the cerebro-spinal fluid:—

#### EXAMINATION OF THE CEREBRO-SPINAL FLUID.

Date.	Colour.	Pres- sure.	Albumin (Nissl).	Phase I.	Cells.	Fluid.	Blood.
Feb. 20, 1912	Normal	240	5	Cloudy	458	Negative	Positive
March 1912	Normal	160	2	Slightly opalescent	29	Negative	Positive
April 1912	Normal	180	1½	0	8	Negative	Negative

We feel that Dreyfus' painstaking investigations should receive careful attention, and, indeed, the cerebro-spinal fluid should be examined in all cases of systemic syphilis, even in cases without objective or subjective cerebral manifestations. In such a manner we might be enabled to prevent a progressive syphilitic, possibly a meta-syphilitic, process of the nervous system.

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## Abstracts

## ANATOMY.

**MEYNERT'S BUNDLE=I.A.K.** *Arbeiten aus dem Hirnanat. Inst. in* (205) *Zurich.*, Hft. vi., 1912.

FUSE has given a minute anatomical description of the cerebellar tract known as Meynert's bundle, or I.A.K. (innere Abteilung des Kleinhirnstiels), and Deiter's nucleus. His conclusions are based on embryological and experimental studies carried out in Monakow's Institute in Zurich, and contain many valuable additions to the already existing knowledge on this region of the brain. The I.A.K. is a definite group of fibres stretching from the caudal end of the med. oblong. to the cerebellum, and passing

through the region of the sixth nucleus. The writer divides it as follows:—

1. Oblongata portion.
2. Pons portion.
3. Cerebellar portion.

Its structure varies in different species of animals. Throughout it consists of a grey reticulum, in which cells of varying size are embedded. Large cells of the Deiter's type are found in the *pars pontis*, and the *pars oblong.*, but the typical group of these cells, the so-called *Deiter's nucl.*, lies in the *pars pontis* only, and consists of a group of giant cells and smaller cells stretching from the junction of the medul. oblong. and cerebellum as far as the oral limit of the I.A.K.

*Bechterew's* nucleus is at the level of the sixth nucleus. It is rudimentary in the lower mammals, but in man well-defined. It consists of small and moderate-sized cells.

*Lewandowsky's* nucleus is very distinct in the lower mammals, indistinct in man. The writer considers this group belongs more to the fifth nucleus than to the I.A.K.

*Ventrally* the I.A.K. is associated with the Tractus solitarius and the spinal fifth nucleus, and the latter association is very intimate and complex.

*Laterally* the I.A.K. is very closely associated with *Burdach's* nucleus.

*Dorsally* the I.A.K. is bounded by *Monakow's striæ*, and it terminates in the central nuclei of the cerebellum.

In man the I.A.K. is much more marked in the ventral direction, and is less well-defined in the portion adjoining the fourth ventricle. In lower animals these two parts are reversed in importance.

The large cells of *Deiter's* nucleus are much fewer in number in man than in the lower mammals, and *Deiter's* nucleus itself is smaller in size. The smaller cells are in contra-distinction considerably increased in number.

The writer found the form of *Deiter's* cells alike in all mammals. They are multipolar, and contain spindle-shaped and rod-like granules. Their dendrites are very thick and long, and their axis cylinder prolongations terminate in medullated fibres. The nucleus, as a rule, contains only one nucleolus.

The associations established by the writer are as follows:—

*A. Cerebello-fugal tracts traversing the I.A.K.*

1. In the cerebellar portion of the I.A.K. lying medially to the *Brach. conj.* numerous fibres enter *Deiter's nucl.* directly, forming associations in all directions. The majority seem to terminate in

the upper portion of the nucleus. There is a connection with the subst. molecularis (Horsley and Clarke).

2. A further bundle from the *Fibræ arcuatæ* of the formatio retic. of the same side.

3. Association between cerebellum and post. long. bundle. This confirms the observations of Van Gehuchten, Winkler, &c.

4. A further tract proceeds within the I.A.K. and lies laterally to the *Brach. conj.* in the cerebellar region.

5. The writer could not confirm the observations of *Biedl* and *Bechterew* regarding a particular lateral bundle tract connected with the cerebellum.

6. On the other hand the nucl. retic. para-olivaris receives numerous fibres direct from the cerebellum, which terminate in the subst. molecularis.

*B. Cerebellopetal tracts.*

1. Associations between the nerve cells of the *formatio reticularis* and *cerebellum*.

2. *Triangulo-cerebellar tract.*

Numerous fibres proceed from nucleus triangularis dorso-laterally, traverse the I.A.K., and enter the cerebellum (Edinger).

3. From *Bechterew's* nucleus there are also fibres to the cerebellum. The writer could not be certain whether these go by way of the *Brach. conjunct.*, whether they end in the central nuclei, or whether they proceed to the decussat. of the nucl. tecti.

4. Fibres proceeding from cells of I.A.K. to cerebellum (*Vejas, v. Gudden, and v. Monakow*).

5. *Associations from Lewandowsky's nucleus* to the cerebellum of the same side. The writer does not agree with *Kohnstamm* that these are *centrifugal*. He could not, however, determine their final goal.

6. A nucleus situated in the caudal level of *Deiter's* nucleus, dorsally to corpus restif., gives off fibres which proceed to the cerebellum of the same side.

7. Fibres from the lateral portion of *Burdach's* nucleus to the cerebellum.

*C. Commissura system* between the two I.A.K.

A system by means of the *Fibræ arcuatæ* through the *Raphe* (observed by *Ramón y Cajal*). The writer could not establish the very finest associations of the commissura tracts either to the grey substance of the cerebellum or to that of the I.A.K. Nor could he establish any certain association of the two I.A.K. by means of the cerebellum.

*D. Associations* between the grey substance of the I.A.K. and the *Form. retic.*

*E. Association* between the grey substance of the I.A.K. and

the spinal cord by means of the dorso-medial part of Burdach's nucleus.

*F.* Associating tracts from the posterior longit. bundle.

*G.* *Associations between nervous vestibularis and I.A.K.* A considerable number of fibres proceed through the I.A.K. to the nucleus tecti.

The writer could not establish any association between these fibres and the sixth nucleus.

*H.* *Associations with the thalamus and corpora quadr.* seemed not improbable to the writer, but he could not be certain of these.

VON MONAKOW (*Neurol. Centralbl.*, No. 13, 1910), who, with Schellenberg, has worked at the subject for years, describes the red nucleus as a large, well-defined group of cells, originating in the neighbourhood of the third nerve. Represented by only a few scattered cells in the lower vertebrates, it attains in mammals the form of a true nucleus.

The primitive nucleus, the so-called nucleus magno-cellularis, which stands out markedly in the lower mammals, reaches its maximum in the ungulata. In the lower apes it begins to diminish in size, and becomes rudimentary in anthropoids. In proportion as the magno-cellularis diminishes, another group of cells, the so-called parvo-cellularis, situated orally, which, lower down in the animal kingdom, is quite rudimentary, gradually assumes larger proportions. In quadrupeds the nucleus magno-cellularis dominates; in the macacus the two groups are about equal in size, whereas in anthropoids the phylo-genetically younger group (parvo-cellularis) represents the chief mass, and is of considerable size. The writer shows that the structure and associations of the red nucleus become more and more complex as the animal kingdom ascends, and keep pace with the development of the frontal lobes and cerebellar hemispheres. The gradual perfection of the red nucleus is characterised by a development of its tegmental portion, through which the spinal cord receives sensory fibres by means of a complex chain of neurons. The writer thinks that the increase of this part of the nucleus expresses anatomically the upright position of man.

LAURA FORSTER.

**SEGMENTAL DISTRIBUTION OF SPINAL ROOT NUCLEUS OF (206) THE TRIGEMINAL NERVE.** ANDREW H. WOODS, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913.

THE author's conclusions are as follows:—

1. It is probable that the *touch* and *pressure* sensations are conducted to the Gasserian ganglion, pass to new axones, enter the



sensory root, and go directly into the chief trigeminal nucleus. Thence new axones conduct them to higher levels, across the raphe and into the lemniscus. And that

2. Pain and temperature sensations pass from the ganglion, also along secondary axones, go through the sensory root down within the "spinal root" to the nucleus of that root. Thence new axones pass cephalad within the formatio reticularis, decussate and finally reach the lemniscus.

3. The two cases here presented suggest that the facial area connected with the caudad end of the "spinal root" nucleus is a band lying along line 8 (Fig. 1), and that each higher level of the nucleus is connected with a band of skin roughly concentric with the first, but nearer the mouth. Finally a zone of skin around the nose and nostrils is connected with the cephalad end of the nucleus. The fibres extending from any skin zone to the corresponding point in the nucleus may pass through all three peripheral branches of the nerve.

D. K. HENDERSON.

**THE DEVELOPMENT OF THE CRANIAL SYMPATHETIC**  
(207) **GANGLIA IN THE PIG.** ALBERT KUNTZ, *Journ. of Comp. Neurol.*, Vol. 23, No. 2, April 15, 1913, pp. 71-96 (15 figs.).

THE mode of development of the ciliary, spheno-palatine, otic, and submaxillary ganglia in the pig corresponds exactly with that of the ganglia of the sympathetic trunks, the prevertebral sympathetic plexuses, and the "vagal sympathetic" plexuses, as found by Kuntz in his earlier studies on the development of the sympathetic nervous system in all vertebrate classes, viz., from (1) cells which migrate out from the ventral part of the neural tube along the motor roots, and (2) from cells which pass peripherally from the *anlagen* of the sensory ganglia. The earliest *anlage* of the ciliary ganglion arises in contact with the oculomotor nerve; cells migrate from the wall of the mesencephalon along the roots of this nerve: later, a small number of cells wander from the Gasserian ganglion peripherally along the ophthalmic nerve to the *anlage* of the ciliary ganglion. In the cases of the spheno-palatine, otic, and submaxillary ganglia cells migrate from the wall of the rhombencephalon along the motor trigeminal roots, and also from the Gasserian ganglion along the maxillary, mandibular, and lingual nerves respectively. Thus all the four cranial autonomic ganglia are formed from a mixture of medullary and ganglionic cells. Kuntz holds that "ontogenetic evidence warrants the conclusion that they are sympathetic in character."

LEONARD J. KIDD.

**THE AFFERENT GANGLIONATED NERVE-FIBRES OF THE**  
 (208) **MUSCLES INNERVATED BY THE FIFTH CRANIAL**  
**NERVE; AND THE INNERVATION OF THE TENSOR**  
**VELI PALATINI AND TENSOR TYMPANI.** F. H. EDGE-  
 WORTH, *Quart. Journ. of Micr. Sci.*, Vol. 58, pt. 4, March 1913,  
 p. 593 (21 figs.).

IN *Macacus cynomolgus*, man, rabbit, and dog, the muscles innervated by the fifth cranial nerve, including the tensor palati and tensor tympani, receive afferent fibres which originate in the Gasserian ganglion and pass into the motor root. This conclusion is based (1) on the results of division of the trigeminal roots proximal to the Gasserian ganglion in two monkeys, and (2) serial sections made through the mandibular division of the fifth nerve in man, rabbit, and dog. Edgeworth finds that "the proportion of ganglionated afferent nerve-fibres found in the muscle-branches of the trigeminus is closely similar to that shown by Sherrington to exist in the branches of spinal nerves passing to skeletal muscles" (*i.e.*, a little over one-third of the total number).

LEONARD J. KIDD.

**THE INNERVATION OF THE BLADDER: ANATOMICAL AND**  
 (209) **EXPERIMENTAL STUDIES.** (*Recherches anatomiques et expérimentales sur l'innervation de la vessie.*) G. DEBAISIEUX, *Le Névraxe*, Vol. 13, F. 2-3, April 1, 1913, pp. 119-159 (35 figs.).

THIS research was undertaken to find out if the sacral autonomic and the thoracico-lumbar sympathetic systems have contrary actions on the bladder-muscle. The twenty-four experiments were performed almost entirely on dogs: sometimes the principal conclusions were controlled on cat and rabbit. Part 1 deals with the anatomical distribution and histology of the vesical nerves, and part 2 with their action on vesical motility. There are numerous points of importance brought out, which must be studied in the original. The author gives the following list of conclusions: (1) The nervus erigens is composed for the most part of medullated fibres which come from the three first sacral roots. Of the motor fibres of this nerve, some ascend to the homolateral hypogastric nerve, others terminate in the ganglia of the pelvic plexus and the "vesical ganglia," properly so-called. (2) A reflex path passes from one nervus erigens to its fellow; the reflex centre is probably in the spinal cord. (3) The hypogastric nerve contains about three hundred medullated fibres: none of these fibres rises in the cells of the inferior mesenteric ganglion: the greater part, if not all, come from the spinal cord by the intermediation of the second, third, and fourth lumbar roots. These are the motor fibres, partly direct and partly crossed. (4) Excitation of the nervus erigens provokes a strong contraction of the corresponding half of the

bladder; excitation of the nervus hypogastricus gives a feebler contraction, also homolateral. It was not possible to determine the slightest antagonism between the functions of these two nerves. The author, therefore, has to conclude that the general law, by virtue of which two systems of nerves of different origin act in an inverse manner on organs containing unstriated muscle, does not apply to the bladder. (5) Stimulation of the central end of the nervus hypogastricus never gave a notable vesical contraction: the reflex described by Sokownin, if it really exist, appears to be an inconstant phenomenon.

As a general rule, Debaisieux found that the contraction-curve obtained by stimulation of the hypogastric nerves was much greater when the nervi erigentes had been previously divided. In his stimulation experiments he used an apparatus like that of Langley. This paper is a model of thoroughness: the innervation of the sphincter vesicæ is to form the subject of a future paper.

LEONARD J. KIDD.

**DISTRIBUTION OF NERVES IN THE HEART.** WINIFRED CULLIS (210) and ENID. M. TRIBE, *Journ. of Physiol.*, Vol. xlv., No. 2, April 25, 1913, p. 141 (11 figs.).

THE authors worked mainly on rabbits, but also on some cats: the heart *in situ* was perfused through the coronary circulation with Locke's solution, by means of a cannula tied into the aorta and connected by rubber tubing to the heart perfusion apparatus of Brodie and Cullis. Conclusions:—After section of the A.-V. bundle, pilocarpine and muscarine do not produce their normal slowing and inhibitor action upon the ventricles, though they act normally upon the auricles; atropine following these drugs abolishes their action upon the auricles, but produces no effect on the ventricles. Under similar conditions adrenalin still produces its normal effects on the ventricles. From this the authors conclude: (1) that the ventricle does not receive vagus fibres, and that therefore the normal action of the vagus on the ventricles is an indirect one; and (2) that the ventricle is abundantly supplied with sympathetic fibres, which do not pass in only by way of the A.-V. bundle.

LEONARD J. KIDD.

## PHYSIOLOGY.

**NOTE ON THE FUNCTIONS OF THE CORTEX CEREBRI.** T. (211) GRAHAM BROWN and C. S. SHERRINGTON (*Proc. Physiol. Soc.*, March 15, 1913), *Journ. Physiol.*, Vol. xlv., No. 2, April 25, 1913, p. xxii.

THE authors found that after destruction of the arm area of the left motor cortex in a chimpanzee ape, "voluntary" movement at

the right elbow was present. In the succeeding few months so great a recovery of the movements of the arm took place that there was no obvious difference between the movements of the two arms. This recovery is not due to regeneration of the area destroyed. It is also not due to the taking over by the corresponding area of the other cortex of the movements of both arms, and it is not due to the taking over by the post-central cortex of the functions of the motor cortex. A. NINIAN BRUCE.

**THE ACTION OF PROSTATIC EXTRACTS ON THE CEREBRAL (212) AND RENAL CIRCULATION.** (*Action des extraits de prostate sur les circulations cérébrale et rénale.*) C. DUBOIS and L. BOULET, *Compt. Rend. Soc. de Biol.*, Vol. lxxiv., No. 14, April 25, 1913, p. 811.

SEVERAL observers have found that intravenous injection of prostatic extracts give a fall of arterial pressure and contraction of the urinary bladder: vaso-dilatation of the penis has been obtained by Hallion, Morel, and Papin (1913). The authors have studied the variations of the volume of the brain by means of the plethysmograph, according to the procedure of Wertheimer, and have found constantly a fall of arterial pressure, with or without a slowing of the heart, together with an augmentation of volume of the brain: they regard this cerebral vaso-dilatation as due to an active vasodilator action. In certain cases, at any rate, prostatic extracts act as an excitant of the vaso-constrictor centres: the volume of the kidneys is usually diminished simultaneously with the fall of arterial pressure.

LEONARD J. KIDD.

**THE EFFECT OF THE REMOVAL OF THE HYPOPHYSIS IN THE (213) DOG.** J. E. SWEET and A. R. ALLEN, *Annals of Surgery*, Vol. lvii., April 1913, p. 485 (6 figs.).

HYPOPHYSECTOMY was performed on twenty-two adult dogs, some being quite old. Three well-marked constant post-operative changes were found on autopsy: (1) the pancreas presented a striking red coloration, similar to that seen at the height of digestion, but no marked microscopical changes were evident in it; (2) genital atrophy, especially of the testes: this appears early, and is extremely marked by the end of the second week; (3) increase of body-weight and obesity appearing some months after operation: its mode of production is uncertain. The authors believe that the entire hypophysis can be removed without danger to life, and that "there is but one surgical indication for operating, namely intracranial pressure." They prefer the intracranial mode of approach.

LEONARD J. KIDD.

**FURTHER STUDIES ON THE RÔLE OF THE HYPOPHYSIS IN**  
 (214) **THE METABOLISM OF CARBOHYDRATES. THE AUTO-**  
**NOMIC CONTROL OF THE PITUITARY GLAND.** L. H. WEED,  
 H. CUSHING, and C. JACOBSON, *Bull. Johns Hopkins Hosp.*, Vol. 24,  
 Feb. 1913, p. 40.

THE authors of this admirably planned and executed experimental study on cats, rabbits, and dogs give the following conclusions:— The pituitary body, and more particularly its posterior lobe, plays a significant role in the metabolism of carbohydrates, and its action in this respect is under the control of fibres which reach the gland by way of the superior cervical sympathetic ganglion. Stimulation of this nervous pathway at the so-called sugar centre in the fourth ventricle, at the superior cervical ganglion, and by excitation of the pituitary body itself, liberates a chemical substance which causes glycogenolysis and glycosuria, independent of any possible nervous impulse reaching the glycogen-holding cells of the muscles or abdominal viscera.

There is an appendix on the significance of "available glycogen": the authors explain clearly the sense in which they use this expression.

LEONARD J. KIDD.

**PINEAL MEDICATION AND FUNCTIONS.** C. L. DANA and W. N.  
 (215) BERKELEY, *Medical Record*, Vol. 83, No. 19, May 10, 1913, p. 835  
 (3 figs.).

THIS paper contains the first record of pineal feeding experiments in young animals and children: these were carried out with the help of Drs H. H. Goddard and W. S. Cornell. Extirpation of the pineal of rabbit and guinea-pig *intra vitam* was found to be impossible: cautery-destruction experiments on young guinea-pigs were incomplete, and are to be pursued on a larger scale. Extracts of the pineals of young bullocks, aged one or two years, had no effect on blood-pressure when injected intra-venously into dogs. Feeding experiments with these pineal extracts gave these results:—(1) Increase of metabolic activity in young babies, as shown by increase of nitrogen in the urine: (2) in young guinea-pigs, rabbits, and kittens, when kept up for a period of some months, definite increase of growth was evident when compared with that of controls. Fifty cases of backward children under the age of eight or nine years, when fed on pineal extracts, gave results which astonished and pleased their school teachers: full particulars of twenty-one cases are given. The authors find that pineal feeding is useless in idiocy and gross physical defect, but of distinct value in cases of simple mental retardation in young children, and also in Mongolism. All parts of this most welcome comparative pineal investigation are to be continued and amplified.

LEONARD J. KIDD.

**ACTION OF CERTAIN DRUGS ON ISOLATED STRIPS OF VEN-**  
(216) **TRIOLE** CONSTANCE LEETHAM, *Journ. of Physiol.*, Vol. xlv, No. 2, April 25, 1913, p. 151 (10 figs.).

THE authoress studied the effects of pilocarpine, muscarine, and adrenalin on cats and two dogs, using the strip method adopted by Porter in 1897. Her work confirms that of Miss Cullis and Mrs Tribe (*v. supra*). She concludes that in ventricular muscle sympathetic nerve-endings are present, but no vagus nerve-endings.

LEONARD J. KIDD.

### **PATHOLOGY.**

**ON TOXIC NEURITIS (NEUROLYSIS) OF THE EIGHTH NERVE**  
(217) **AND ON THE CHANGES IN THE CORRESPONDING**  
**GANGLIA IN DIPHTHERIA.** LEO LEWIN, *Ztschr. f. Ohrenheilk.*, Bd. lxxvii., Feb. 1913, S. 193.

THE nerves and ganglia from fifteen children who had died of diphtheria were examined. In one case there was acute otitis media, and in a second some mucous in the middle ear, otherwise the middle ear was healthy. Changes were found in the nerves in seven cases, four bilateral; and in the ganglia in ten cases, all bilateral. In each case both long and cross sections were cut. Cross sections of the nerve unstained and with small magnification showed numerous disseminated islets of various form and size, lighter in colour than the surrounding tissue. Stained by the Weigert-Pal method, the islets showed light yellow in the black stained tissues. The high power showed they consisted of small, close-lying granules like dust sprinkled on a lighter background, some scattered round nuclei, here and there cells with large nucleus and little protoplasm, as well as bodies resembling corpora amylacea. Longitudinal section showed the nerve fibres deviating to make room for these spaces. Some fibres disappeared in the granular substance, others lost their coats and went on as axis cylinders, others further degenerated showed themselves as rows of myelin globules. The surrounding tissue was sometimes normal, but it often showed various stages of parenchymatous degeneration. These changes were never found in the facial nerve. Changes were also found in the vessels, dilatation and hæmorrhages. The author does not think the changes are artefacts, and argues the point. He thinks the granules sprinkled on a homogeneous background represent the coagulation product of a fluid, a transudation from the diluted vessels which has a toxic effect on the nerves. He draws attention to the striking similarity of the changes

Eppinger found post mortem in hearts from cases of diphtheria which had died of heart failure.

The changes in the ganglion cells were very various, usually they showed shrinking of the protoplasm and the Nissl's granules did not stain well.

R. VÉREL.

## CLINICAL NEUROLOGY.

**A NEW ESTHESIOMETER.** SIEGMUND AUERBACH. *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913.

A VERY useful form of pocket esthesiometer has been devised by Auerbach which allows one to test all the qualities of sensation of the skin with the exception of perceiving both points of a compass and also excepting electro-cutaneous sensibility. The instrument is manufactured by Kay, Scherer, & Company, and costs seven dollars.

D. K. HENDERSON.

**CORNEAL SENSIBILITY AND CORNEAL NERVE-TERMINATIONS IN NEWLY-BORN CHILDREN.** (La sensibilité cornéenne et les terminaisons nerveuses dans la cornée du nouveau-né). VERDERAME (*Congrès d'Ophthal. d'Heidelberg*, 1912), *Arch. d'Ophthalmol.*, Vol. 33, April 1913, p. 248.

AXENFELD found that corneal sensibility is very feeble in the newly-born. The author has examined 200 newly-born children and nurselings up to the age of two years. Corneal sensibility does not appear till the fourth day, and is fully developed only by the sixth to tenth month. The methylene blue method shows no histological differences between the corneal nerve-terminations of the newly-born and the adult. The feeble corneal sensibility in the former must then depend on incomplete development of sensory conduction or perception.

LEONARD J. KIDD.

**A CASE OF DYSTONIA MUSCULORUM DEFORMANS (OPPENHEIM).** I. ABRAHAMSON, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 1, Jan. 1913, p. 38.

A JEWISH girl, 13 years, who five years ago started to have tonic spasms of her right hand, interfering with her writing. One year later the left hand became similarly involved. For the past two years marked disturbances of gait and station; she also exhibits scoliosis with slight lordosis, easily induced fatigue, absence of hypertonus, loss of tendon reflexes in the upper and inconstant presence in the lower extremities, and absence of grimacing or facial over-action.

D. K. HENDERSON.

**MYATONIA CONGENITA.** ALFRED GORDON, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 109.

Two cases are briefly reported presenting partly the symptom-group of Oppenheim's disease, and partly that of Werdnig-Hoffmann's type.

D. K. HENDERSON.

**PRURITUS IN TABES AND ARSENO-BENZOL.** (*Prurit tabétique et arsénobenzol.*) M. PUJOL, *Progrès méd.*, 1913, xli., p. 100.

A CASE of lumbo-sacral pruritus in a man, aged 41, accompanied by slight lichenification. There was no inco-ordination, and the knee jerks were normal, though the ankle jerks were lost. The pruritus had persisted for eight weeks in spite of treatment, and presented intolerable exacerbations. Complete disappearance of the pruritus and slight improvement in the lightning pains followed small and repeated doses of neo-salvarsan. Wassermann's reaction remained positive, and the spinal lymphocytosis was not affected.

J. D. ROLLESTON.

**EPIDEMIC CEREBRO-SPINAL MENINGITIS CURED BY DIPHTHERIA ANTITOXIN.** (*Ein Fall von epidemischer Zerebro-spinalmeningitis geheilt durch Antidiphtherieserum.*) N. A. RAWITSCH, *Zentralbl. f. inn. Med.*, 1913, xxxiv., p. 393.

A RECORD of a case in a youth, aged 17, who showed a number of meningeal symptoms, including facial herpes, but no lumbar puncture was performed. Antimeningococcic serum not being available, three subcutaneous injections of diphtheria antitoxin were given and recovery took place (*v. Review*, 1909, vii., p. 607).

J. D. ROLLESTON.

**PARAMENINGOCOCCUS CEREBRO - SPINAL MENINGITIS.** (224) **MENINGOCOCCAL AND PARAMENINGOCOCCAL SEROTHERAPY. DEATH.** (*Méningite cérébro-spinale paraméningococcique. Sérothérapie méningococcique etparaméningococcique. Mort.*) A. FOLLET and J. BOURDINIERE. *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 505.

A CASE in a woman, aged 27. No improvement followed the use of parameningococcus serum, but each fresh injection increased the purulence of the cerebro-spinal fluid and the number of micro-organisms, and aggravated the symptoms. Possibly the result may have been due to anaphylaxis, as the first injection had been given thirteen days before. On the other hand, serum meningitis, as described by Sicard (*v. Review*, 1910, viii., p. 702), is characterised by an intense polymorphonuclear reaction but an absence of micro-organisms. A more probable explanation is that



there was a special variety of parameningococcus at work, which was not affected by the serum used. J. D. ROLLESTON.

**MENINGEAL STATE AT THE ONSET OF SEVERE AND PROLONGED PARATYPHOID B FEVER.** (Etat méningé au début d'une fièvre paratyphoïde B grave et prolongée.) L. BORDIN, *Gaz. d. Hôp.*, 1913, lxxxvi., p. 229.

A MAN, aged 29, suddenly developed symptoms resembling cerebro-spinal meningitis. The cerebro-spinal fluid was clear, sterile, and without marked hypertension. On the tenth day the meningeal symptoms diminished, and on the thirteenth rose spots appeared on the trunk. The general appearance was that of typhoid fever, but Widal's reaction was negative, and paratyphoid B bacillus was isolated from the blood. The temperature became normal on the forty-seventh day, and recovery took place without complications. J. D. ROLLESTON.

**TWO SIMULTANEOUS CASES OF ACUTE POLIOMYELITIS IN TWO CHILDREN OF THE SAME FAMILY: TYPICAL PARALYSIS IN ONE, SIMPLE MENINGEAL STATE IN THE OTHER.** (Deux cas simultanés de poliomyélite aiguë chez deux enfants d'une même famille: Paralysies typiques chez l'un; simple état méningé chez l'autre.) R. MORICHAU-BEAUCHANT, R. GUYONNET, and CORBIN, *Bull. et. mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 543.

A GIRL, aged 5 years, was suddenly seized with headache, vomiting, and fever, followed next day by nuchal rigidity and Kernig's sign, and on the third day by almost complete paralysis of the right leg and left arm. The fever disappeared on the fourth day, and the general condition improved, but the paralysis persisted. The cerebro-spinal fluid was clear and sterile, and contained a small quantity of lymphocytes and polymorphs in equal proportions.

A sister, aged 4 years, was taken ill with meningeal symptoms one week after the onset of the first child's illness. The symptoms lasted three days and then disappeared, and no paralysis developed, though there was a diffuse muscular weakness for two days.

J. D. ROLLESTON.

**ON A CASE OF RECKLINGHAUSEN'S DISEASE WITH HYPERNEPHROMA.** (Ueber einen Fall von Morbus Recklinghausen, mit Hypernephroma.) SAALMANN, *Virchow's Archiv*, 1913, ccxi., p. 424.

A WOMAN, aged 35, suffering from typical Recklinghausen's disease, died from pulmonary embolism following an operation for removal of an elephantiasic tumour of the arm. Post mortem a hyper-

nephroma, which had originated in a suprarenal rest, was found in the liver. The suprarenals themselves were normal. Reference is made to a similar case reported by Kawashima (*v. Review*, 1911, ix., p. 387).  
J. D. ROLLESTON.

**FOUR FAMILIAL CASES OF MULTIPLE NEUROMYXOFIBRO-**  
(228) **SARCOMATOSIS.** (Vier familiäre Fälle von multipler neuro-  
myxofibrosarcomatose.) A. MATHIES, *Ztschr. f. klin. Med.*, 1913,  
lxxvii., p. 50.

A RECORD of a woman, aged 35, and her three sons, aged 14, 12, and 10 years respectively. In the mother the disease began at 15, in the two elder children it was noticed before they first attended school, and in the youngest child it was not seen until he was examined by Mathies. None of the cases showed tumours or pigmentation of the skin or mucosæ, but all had tumours of the peripheral nerves. None showed any intellectual impairment. In the mother the diagnosis of tumours of the cranial nerves made during life was confirmed after death. All but V. and XII. were affected. The spinal nerve roots, intercostal, ulnar, median musculo-spiral, sciatic and cervical sympathetic also showed small tumours. The eldest son showed involvement of II., VI., and VIII., and numerous tumours of the peripheral nerves. In the other two children there were a few tumours confined to the peripheral nerve. Examination of the tumours in all the cases showed their myxofibrosarcomatous nature. The mother was nine months pregnant at the time of death. Nothing abnormal was found in examination of the nerves of the fœtus.  
J. D. ROLLESTON.

**ON THE OCCURRENCE OF A HEMIANOPIC CENTRAL SCOTOMA**  
(329) **IN DISSEMINATED SCLEROSIS AND RETROBULBAR**  
**NEURITIS (NEURITIS OF THE CHIASMA AND OPTIC**  
**TRACT).** (Ueber des Vorkommen eines hemianopischen zentralen  
Skotoms bei disseminierter Sclerose und retrobulbärer Neuritis  
(neuritis chiasmatis et tractus optici).) RÖNNE, *Klin. Monats-*  
*blätter f. Augenheilk.*, Vol. 50, 1912, S. 446.

HEMIOPIC conditions of the field of vision, which indicate the optic chiasma or tracts as the site of the lesion, have up to the present been generally attributed to some influence acting on the chiasma from outside, such as pressure. The occurrence of a primary lesion of the chiasma has, however, been established in certain cases of acute myelitis associated with retrobulbar neuritis, and other cases have been described in connection with blood poisoning and tabes.

In the present paper five cases are described in which hemiopic central scotomata occurred. These scotomata are characterised by

a straight mesial border which follows the vertical meridian of the field of vision, almost always dividing the fixation point. The scotoma may involve the apices of one or more quadrants, the central part of the field behaving somewhat as an independent field within the field of vision.

In the first two cases the diagnosis of disseminated sclerosis was fully established by other evidence, the nature of the scotomata indicating the presence of affected foci in the optic tracts. In the remainder the cause was obscure, and they are held by the author to be analagous to cases of acute idiopathic retrobulbar neuritis, differing only in the more posterior situation of the lesion, and therefore belonging to the, at present, little known group of primary lesions of this part of the optic path.

The author concludes by expressing the hope, which must be heartily endorsed, that the possibility of the presence of such primary lesions in connection with the hemiopia of chiasmal origin will always be considered.

H. M. TRAQUAIR.

**CEREBRAL HEMIPLEGIA WITH ATROPHY, FLACCIDITY, AND (230) LOSS OF REFLEXES.** F. X. DERCUM, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 111.

THE case is reported of a man, 31 years, who ten days after a head trauma developed a right-sided hemiplegia and a sensori-motor aphasia.

D. K. HENDERSON.

**DIPHTHERITIC HEMIPLEGIA.** J. D. ROLLESTON, *Proc. Roy. Soc. (231) Med.*, 1913, vi. (Clin. Sect.), p. 69, and *Clin. Journ.*, 1913, xlii., p. 12.

THE author briefly relates 6 personal cases which occurred among a total of 9,075 completed cases of diphtheria in the course of thirteen years, and mentions the cases published since his last paper on the subject (*v. Review*, 1905, iii., p. 722). Eighty cases are now on record: 28 were males, 37 females, and in 15 the sex was not stated. The ages ranged from 1½ to 17 years. Right hemiplegia occurred in 48, in 21 of whom aphasia was noted, left in 27, and in 5 no details were given. The hemiplegia occurred at the following dates: First week, 1 case; second week, 14; third, 27; fourth to seventh, 12. In 14 cases where no exact date is given it is said to have occurred in convalescence, in 12 no date whatever is given. Recovery took place in 52, death in 24, and in 4 no details are given. Necropsies were held in 18 cases: embolism was found in 13, thrombosis in 3, hæmorrhage in 1, and sclerotic atrophy in 1. In all the cases where details are given the initial attack was severe. Albuminuria and ordinary diphtheritic paralysis were present in a large number.

AUTHOR'S ABSTRACT.

**A CASE OF THROMBOSIS OF THE VERTEBRAL AND POSTERIOR (232) AND INFERIOR CEREBELLAR ARTERIES.** (Di un caso di trombosi dell'arteria vertebrale e delle cerebellare posteriore ed inferiore.) A. SALMON, *Lo Sperimentale*, 1913, lxvi., p. 442.

A CASE of an alcoholic man, aged 68, whose symptoms were vertigo, vomiting, hypæsthesia of the left side of the face, paralysis of the left ocular sympathetic and lower facial, disturbances of deglutition from lesions of the nucleus ambiguus, anæsthesia in the right upper and lower limbs, asynergy of the left lower limb, with tendency to fall on the same side, and loss of tendon reflexes in all four limbs.

The absence of any affection of X. and XII. was explained by the fact that their nuclei are supplied by the anterior spinal artery.

Some improvement took place owing to the establishment of collateral circulation. J. D. ROLLESTON.

**TYPHOID SPINE.** (*La spondylite typhique.*) J. BONHOURE, *Thèses. de* (233) *Paris*, 1912-13, No. 118.

TYPHOID spine is most frequent between 15 and 35. In eight out of ten cases it affects the male sex. It may be met with in all forms of typhoid fever, but is most frequent after severe attacks. It may occur in the course of the disease, or more frequently during and after convalescence. The original seat of the lesions is the lumbar column. The symptoms are divided into osteo-articular, radiculo-medullary, and general. The X-rays show (1) changes in the intervertebral discs; (2) thickening of the perivertebral tissue and vertebral periosteum; and (3) lesions in the bodies of the vertebræ. Treatment consists in early and prolonged immobilisation. Lumbar puncture may give relief when there is cerebro-spinal hypertension. Massage and gymnastic exercises may be required later to overcome the spinal rigidity. The thesis contains the histories of seventy cases collected from literature from 1889, when the condition was first described by Gibney, to 1912. J. D. ROLLESTON.

**CEREBELLAR INTERMITTENT CLAUDICATION.** T. H. WEISEN- (234) BURG, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 110.

THE patient, a boy 14 years, at three months had erysipelas complicated by encephalitis, followed by typical epileptic convulsions, which persisted until the boy was 5 years of age. At the age of 5 the patient began to have attacks in which he became paralysed on the right side, and which lasted from a few minutes

to several hours or a day. About a year later he began to have similar attacks on the left side, and since then when excited, or sometimes without any cause, he develops a hemiplegic attack either on the right or the left side, and rarely both. No similar case is on record.

D. K. HENDERSON.

**UNILATERAL INTERMITTENT CLAUDICATION OF THE**  
(235) **LUMBAR REGION.** J. RAMSAY HUNT, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 123.

THE case of a woman, 66 years old, who had been under observation for ten years, and in whom the lumbar pains were strictly limited to one side.

D. K. HENDERSON.

**SUPPURATION IN THE NEEDLE TRACK AFTER LUMBAR**  
(236) **PUNCTURE.** (Zur Frage der Sticheiterung nach Lumbalpunktion), E. H. B. VAN LIER (Utrecht), *Mitteil. a. d. Grenzgeb. d. Med. u. Chir.*, 1912, xxv., p. 132.

A RECORD of two cases. 1. Girl, aged 14, admitted to hospital with continued fever. No evidence of typhoid, tuberculosis, or meningitis. The fluid drawn off in the first two lumbar punctures was purulent, but in the third was clear, though it contained an excess of polymorphs and staphylococci. The pus was then found to be due to an abscess in the sacrospinalis muscle. Recovery took place after multiple abscesses, but no meningitis ensued.

2. Case of chondrodystrophy with spinal deformity. Lumbar puncture was performed in the morning, and the temperature, hitherto normal, rose to 104° the same evening. Death from pyæmia some weeks later. The necropsy showed circumscribed purulent meningitis and suppuration extending along the nerve lymph sheaths caused by bilateral psoas abscess, as well as purulent pericarditis and pulmonary abscess.

J. D. ROLLESTON.

**A CASE OF SPASTIC PARAPLEGIA, WITH DORSAL ROOT**  
(237) **SECTION FOR PAIN AND SPASTICITY.** LESSER KAUFFMANN and PRESCOTT LE BRETON, *Journ. Amer. Med. Assoc.*, No. 13, March 29, 1913, p. 982.

PATIENT was a man, aged 37, single, with a positive Wassermann, who had for some time past complained of girdle pain with some numbness of the legs and trouble in walking. On admission to hospital a diagnosis of hysteria was made, changed later to spastic paraplegia due to syphilis of the cord. In spite of three doses of salvarsan, the positive signs of spinal cord involvement grew worse, and great pain in the abdomen and legs was complained of. The spasticity increased until he could be lifted from the bed like

a board, and as the pain and spasticity were still increasing and were unrelieved by treatment, it was decided to divide the posterior nerve roots in the lower dorsal region. This was done. Next day the spasticity had disappeared, the loss of bladder control was complete, and there was great pain still inside the abdomen. In ten weeks' time the spasticity had completely returned, the pain continued to get worse, and he died from inanition and exhaustion. No necropsy.

A. NINIAN BRUCE.

**CEREBELLAR TUMOUR.** MAX MAILHOUSE and W. F. VERDI, *Journ. (238) Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 118.

AN interesting case of successful removal of a cerebellar tumour in a girl 15 years old. The patient has made a complete recovery.

D. K. HENDERSON.

**MENINGEAL FIBRO-ENDOTHELIOMATA.** HARVEY CUSHING, *Journ. (239) Nerv. and Ment. Dis.*, Vol. 40, No. 1, Jan. 1913, p. 41.

A NUMBER of cases were reported in detail, and the subject was discussed generally by Starr, Sachs, Ramsay Hunt, Kennedy, Abrahamson, and Clark.

D. K. HENDERSON.

**PITUITARY AND UNCINATE SYMPTOMS AND LESIONS.** (240) CHARLES K. MILLS and WILLIAM B. CADWALADER, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913, p. 114.

Two cases are described and the different types of pituitary disease are discussed.

D. K. HENDERSON.

**CONTRIBUTION TO THE ÆTIOLOGY OF BITEMPORAL HEMI- (241) OPIA WITH PARTICULAR REFERENCE TO HYPOPHYSIS DISEASE.** (Beitrag zur Aetiologie der bitemporalen Hemianopsie mit besonderer Berücksichtigung der Hypophysiskrankungen.) BOGATSCH, *Klin. Monatsbl. f. Augenheilk.*, Bd. 50, 1912, S. 313.

SINCE the work of Marie in 1886 stimulated increased attention to pituitary disease as a factor of importance in bitemporal hemiopia its presence has been much more frequently diagnosed. Statistics of 59 cases reported before 1886 show 5 per cent. as due to pituitary disease, and 40 per cent. without known cause, while of 256 reported since that date no less than 50 per cent. are attributed to this cause and the unexplained cases are reduced to 13 per cent. More exact details are given in tabulated form of 34 additional cases, of which 19 occurred in connection with

proved or probable pituitary disorder, while in 6 no cause could be assigned. The remaining cases are attributed to sixteen different causes, amongst which basal syphilis, tumours in the neighbourhood of the pituitary, fractures, vascular disease and meningitis are the most productive.

The diagnosis of hypophysis disease may be regarded as established if there is positive evidence in regard to three points: bitemporal hemiopia, the general condition of the patient and the result of X-ray examination.

The occurrence of relative hemiopia and of paracentral scotomata is mentioned but without suggesting any inference as to the diagnostic significance of these symptoms.

The author refuses to accept the view recently advanced by Fuchs that bitemporal hemiopia may be due to tabes until actual post-mortem evidence is forthcoming.

Some light is thrown upon the relation of acromegaly to pituitary disease and bitemporal hemiopia by these figures, which show in the larger series of 315 cases 40 per cent. of acromegalies in 118 pituitary cases, and in the additional 34 cases in 19 pituitary cases 10 per cent. of acromegalies. On this evidence the majority of cases of hypophyseal disease with bitemporal hemiopia would appear to be unassociated with acromegaly, though more statistics and further investigation will be necessary to show which of these two percentages more nearly indicates the true relation, which depends, of course, to a great extent on the minuteness of the examination of the field of vision. Those who are interested in this subject will find a great deal of information in this very useful paper.

H. M. TRAQUAIR.

**INFANTILISM.** (*A propos d'infantilisme.*) F. D'HOLLANDER, *Journ. (242) de Neurol.*, Ann. 17, No. 11, June 5, 1912, p. 201.

AN account of a case of very pronounced infantilism, the patient being a woman of 40, suffering from an attack of acute excitement. When 7 years old the patient had an attack of typhus fever, and from that time she never developed normally. The author thinks that one of the ductless glands, probably the thyroid, may have been injured by the typhus toxin. He also points out that the symptoms could be accounted for by the assumption that a number of the ductless glands were not functioning properly. Several of the other members of the family were cretins (thyroid), there was complete absence of secondary sexual characteristics (ovaries), there was marked disproportion between the size of the hands and feet and the rest of the body (pituitary), and the skin of the forehead was abnormally pigmented (suprarenals).

W. BOYD.

**EUNUCHOIDISM IN DIABETES INSIPIDUS.** (Ueber Eunuchoidismus bei Diabetes insipidus.) ERICH ESSTEIN, *Mitteil. a. d. Grenzgeb. der Med. u. Chir.*, 1912, xxv., p. 441.

A RECORD of two cases. 1. Man aged 52. In addition to symptoms of diabetes insipidus of 16 years' duration there were a tumour of the hypophysis, with bitemporal hemiachromatopsia, adiposity of the lower abdomen, breasts, upper arms and thighs, genital hypoplasia and impotence, changes in the hair (oligotrichosis lanugensis et terminalis), and trophic disturbances in the skin.

2. Boy aged 15. In addition to diabetes insipidus he had the characteristic adiposity, genital hypoplasia, and oligotrichosis. There was no definite evidence of a pituitary tumour, but the low blood-pressure and small thyroid showed that other glands of internal secretion were affected.

J. D. ROLLESTON.

**LOCALISED ENCEPHALITIS WITH EPILEPSIA CONTINUA.** (244) S. KRUMHOLZ, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 1, Jan. 1913.

THE case of a girl, 14 years, who after a prodromal period of a few days became suddenly ill with epilepsy continua without any known cause. During the illness, which lasted for twenty-five days, she had one general epileptic convulsion, but otherwise presented clonic convulsions of separate muscle groups, Jacksonian in type, which persisted with equal frequency until fatal termination. The autopsy showed acute cerebral changes characteristic of encephalitis hemorrhagica, and a vehement gliomatous proliferation of the left motor cortical region. The difficulties of diagnosis are discussed in detail.

D. K. HENDERSON.

**SYPHILIS WITH CONCEALED PRIMARY LESION.** (Über Syphilis mit verstecktem Primäraffekt.) J. ALMKVIST, *Dermat. Wchenschr.*, 1913, lvi., p. 190.

A MAN, aged 20, contracted syphilis and gonorrhœa simultaneously. Although he was kept under close examination, no primary lesion was found. About three months after infection a maculo-papular eruption appeared. Examination of the urethral discharge then showed typical *Spirochæta pallida* and an erosion was found in the urethra behind the fossa navicularis.

J. D. ROLLESTON.



**ON "PRECOCIOUS" CEREBRAL SYPHILIS.** (In tema di sifilide (246) cerebrale "precoca.") G. PELLACANI, *Riv. di Patol. nerv. e ment.*, 1912, xvii., p. 536.

THE term "precocious" as applied to cerebral syphilis is incorrect, as the great majority of cases of cerebral involvement occur at an early stage of the infection. Pellacani records three cases in men, aged 44, 34, and 21 respectively, of gummatous basal meningitis, the symptoms of which developed eight to nine months after the chancre in two cases, and in a little more than one month in the third. The most striking clinical feature was the unilateral peripheral paralysis of certain cranial nerves. The seventh nerve was affected in all three, and in two the twelfth and eighth nerves also. Psychical symptoms were present in all, depression was marked, and led in two cases to suicidal attempts. Rapid improvement followed treatment by salvarsan and grey oil, and Wassermann's reaction, which had at first been positive, became negative two months after treatment in each case.

J. D. ROLLESTON.

**THE WASSERMANN REACTION IN DIABETES MELLITUS, WITH (247) SPECIAL REFERENCE TO ITS RELATION TO ACIDOSIS.**

JOHN H. RICHARDS, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 15, April 12, 1913.

IN four cases of diabetes with marked acidosis, a positive Wassermann reaction was found which was unaffected by antisyphilitic treatment. In two cases of diabetes, in which the urine showed no acetone bodies in one, and only a slight amount of acetone in the other, the Wassermann reaction was negative, and in one case of non-diabetic acetonuria, with the absence of diacetic acid and of beta-oxybutyric acid, the reaction was also negative.

Syphilis was not an etiologic factor in any of the cases studied, and thus a positive Wassermann reaction in diabetic acidosis is not necessarily indicative of syphilis.

A. NINIAN BRUCE.

**ANURIA—PERHAPS HYSTERIC.** F. J. SHEAHAN, *Journ. Amer. Med. Assoc.*, 1913, lx., p. 286.

A CASE of complete anuria in a man, aged 25, in whom the writer says deception could be excluded. Cystoscopy and catheterisation of the ureters showed that there was no obstruction. Headache, vomiting, muscular twitching, and general anasarca developed. After other treatment had failed, recovery followed the administration of a powerful kidney stimulant. Reference is made to Charcot's case of a hysterical young woman in whom suppression lasted eleven days, and to Bailey's case in a girl of 11 years who passed no urine for three days.

J. D. ROLLESTON.

- ADIPOSIS DOLOROSA IN SCIATICA: A VARIETY LOCALISED**  
 (249) **IN THE AFFECTED LOWER LIMB.** (Sur une variété d'adipose douloureuse localisée aux membres inférieurs atteintes de sciatique.) M. FAVRE and A. TOURNADE, *Lyon Médical.*, Vol. 120, No. 19, May 11, 1913, p. 1005.

THE authors have studied clinically the subcutaneous thickening of the cellular tissue of the affected lower limb in sciatica, which was described by Landouzy in 1875: it is easily demonstrated on picking up the integuments between finger and thumb: it is not constant, but occurs especially in inveterate cases: the limb may be greatly enlarged by this local adiposis which is painful on manipulation: nodular thickenings may be present. It is very amenable to massage, directed specially to the nodules: the cellular tissue also should be kneaded. The authors regard this panniculitis as trophic, and due to the neuritis; in its turn it compresses and irritates the sensory nerve-fibres, and so keeps up the neuralgic pains. But the circumscribed panniculitis is not always secondary. A case is quoted in which the cellulitis was apparently primary: a young rheumatic girl showed a plaque of tender induration in one buttock, that developed in the course of a few days: it was accompanied by radiating pains in the whole of the gluteal region: a year previously she had had a similar attack which yielded to massage in a few days.

LEONARD J. KIDD.

- CLINICAL AND PATHOLOGICAL-ANATOMICAL STUDIES ON**  
 (250) **THE QUESTION OF LABYRINTH SUPPURATION.** W. BURK, *Ztschr. f. Ohrenheilk.*, Bd. lxvi.-lxvii., Nov. and Jan. 1912 and 1913, pp. 267 and 1.

A VERY full description is given of the histological findings in eight temporal bones showing suppurative labyrinthitis. The conditions are illustrated by excellent drawings. The cases are discussed in full. The cause of labyrinthitis was in four cases acute otitis media, in three chronic middle ear suppuration with cholesteatoma, in one a primary tumour of the tympanic cavity. In the acute cases the infection reached the labyrinth in one through the macroscopically intact windows, in one by way of an extradural abscess of the posterior fossa, in one by a defect in the external canal, and in one by destruction of the ampullary limb of the posterior canal, caused by an inflammatory process in the wall of the jugular bulb. In the chronic cases, in two by defect in the horizontal canal and irruption of fibrous tissue through the windows, in one by opening of all canals and irruption of granulation tissue through the round window. In these cases fibrous tissue and fresh suppuration were present together. In the

tumour case the round window was destroyed. Sinus thrombosis complicated four cases, extradural abscess three, cerebellar abscess one. Meningitis caused death in seven cases, cerebellar abscess in one (early meningitis was present). In four of the cases meningitis spread from the labyrinth; in two along the sheath of the cochlear nerve and the aqueduct of the cochlea; in two by the aqueduct of the cochlea. A very full discussion of the question of labyrinthitis follows, founded on 155 collected cases, in which histological examination of the inner ear has been made. The cases comprise the following: acute middle ear 34, scarlatina 14, tuberculous 29, chronic middle ear 78. The discussion includes the questions of suppurative labyrinthitis, serous labyrinthitis (does it exist?), circumscribed labyrinthitis, diagnosis, prognosis, and treatment. Treatment consists in absolute rest in bed or the labyrinth operation. If for any other reason an operation is necessary, the labyrinth must be operated on at the same time. An abstracted literature follows.

R. VÉREL.

**PELLAGRA, with special Reference to Pathology of Gastro-Intestinal** (251) **Tract.** H. P. MILLS, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 12, March 22, 1913, p. 889.

A BRIEF report of four cases of pellagra with post-mortem findings, with special reference to lesions of the digestive tract. All four cases were females, and died at the ages of 57, 64, 40, and 59 respectively. The first case showed catarrhal inflammation of the ileum, cœcum, and ascending colon. The second showed catarrhal inflammation of the lower quarter of the œsophagus and all the stomach, with redness of the duodenum and inflammation of the jejunum, ileum, and cœcum. The descending colon, sigmoid, and rectum were normal. The third showed catarrhal inflammation of the entire tract from the stomach to the cœcum, and the fourth showed a similar condition from the duodenum to the hepatic flexure. The nervous system was not examined in any of the cases.

On the whole the changes found were those of a chronic catarrhal inflammation, and would seem to coincide with the theory that toxic products cause pellagra, whether taken with food or of endogenous origin.

A. NINIAN BRUCE.

**PERIODICITY IN THE MALE.** C. P. OBERNDORF, *Journ. Nerv. and* (252) *Ment. Dis.*, Vol. 40, No. 1, Jan. 1913, p. 37.

THE case of a man, 28 years, whose physical development had progressed normally up to the age of 13, when he noticed that his left breast gradually began to increase in size, until it

attained its present development, about the size of that of a young girl.

At 18 he began to notice that his sexual desires were active only once a month, and that at the same time the left breast would become not only stiff and erect, but also extremely sensitive and tender, a condition which usually persisted for about four days.

On account of worry over his physical condition he merged into a psychosis.

D. K. HENDERSON.

## PSYCHIATRY.

### TWO NEW CASES OF SUPPURATIVE PAROTITIS IN GENERAL

(253) **PARALYSIS.** (*Deux nouveaux cas de parotidite suppurée chez des paralytiques généraux.*) R. HORAND, P. PUILLET, and L. MOREL, *Gaz. des Hôp.*, 1912, lxxxv., p. 1953.

CASE 1. Man, aged 50. Left parotitis. Incision without anæsthesia. Death a week later, a fortnight after the onset of parotitis.

CASE 2. Woman, aged 50. Right parotitis followed by death four days later. No operation. Parotitis is rare in general paralysis. It is more frequent on the right, possibly on account of the lateral decubitus. It is a very grave sign.

J. D. ROLLESTON.

### THE DUCTLESS GLANDS IN DEMENTIA PRÆCOX. F. X.

(254) **DERCUM** and A. G. ELLIS, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 2, Feb. 1913.

THE authors believe that dementia præcox is in all probability due to a toxin or toxins which call forth, by their action on the cortical neurones, hallucinations and delusions. Acting on this assumption they have investigated grossly and microscopically several of the ductless glands in eight cases of dementia præcox.

The clinical records are exceedingly meagre, all of the patients suffered from extensive tuberculosis—which must invalidate the results—and it is admitted that their results are difficult of interpretation.

The thyroid, hypophysis, adrenals, parathyroids, and carotid bodies were the glands investigated.

D. K. HENDERSON.

### BETARDATION AND CONSTITUTIONAL INFERIORITY. J. J.

(255) **THOMAS**, *Journ. Nerv. and Ment. Dis.*, Vol. 40, No. 1, Jan. 1913.

A STATISTICAL review is given of the number of backward children in the Boston public schools during the years 1909, 1910, and 1911. The relationship of feeble-mindedness to crime is con-

sidered, and various educative and remedial measures are suggested. For slight grades of mental defect special classes in schools are recommended which should be under medical supervision so as to prevent such classes being filled by unimprovable imbeciles. It is also recommended that medical men should be in association with the courts so that the mentality of abnormal persons may be investigated, and so that the needs of each individual case may be accurately determined.

D. K. HENDERSON.

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## Reviews.

**CONTRIBUTION À L'ÉTUDE DE CERTAINES FACULTÉS CÉRÉ-**  
 (256) **BRALES MÉCONNUES.** Dr W. C. DE SERMYN. Paris: Félix  
 Alcan, 1911. Pp. 612. Price 7 fr. 50.

THIS is in many ways a remarkable book. It is certainly a record of a remarkable number of extraordinary cases, which have come under the notice of one observer. The book is divided into three parts: first, extraordinary cases observed by the author; second, an analysis of the facts observed; and third, the philosophy which emerges from this analysis. From the purely medical standpoint, the first section is naturally the one of the greatest interest and most deserving of attention. The simple recording of the facts of such cases as these which partake of a mysterious and even mystical nature is difficult enough, but when one finds 500 pages devoted to theorising on these facts, one feels loth to follow the author on to such dangerous and treacherous ground. The cases themselves, however, are of the deepest interest. There are three cases of predicted death, four of premonitory dreams, and a number of miscellaneous ones. The case of Jean Vitalis is characteristic. A robust, well-nourished man, 39 years of age, was suddenly seized with an acute attack of rheumatic fever. The joints of the shoulder, hands, and knees were swollen and very painful, but on the morning of the sixteenth day his physician found to his surprise that his patient was up, fully dressed, and appeared to be perfectly well. He attributed his sudden recovery to a vision of his father which he had had in the night; he had been informed at the same time that he would die next evening at nine o'clock precisely. The author examined the patient with the greatest care, but could detect no abnormality in his physical condition. Nevertheless, when the fatal hour arrived he called his family around him, lay down upon a couch, and died in the presence of the doctor as the clock struck nine. The other cases of predicted death are equally striking. A certain explanation of these cases

may be hazarded on a physical basis, but it is difficult or impossible to do so in the cases of premonitory dreams, and still more so in such a case as the following. The author was one day called in to see a young woman dying from profuse uterine hæmorrhage, due to an abortion. It appeared that she had been seduced, and with her dying breath she cursed her seducer, ending with the words, "let cancer devour him." Four months later the author was called in consultation to see a young man with a large cancer of the upper lip. It was the seducer, on whom the curse had fallen. The element of chance, so marked in such a case as this, can be eliminated from the cases of Mary B—— and Giselle, which, however, must be read in full. The discussion which follows these cases is full in the extreme, but the main thesis which emerges is that the powers possessed by the ordinary medium are normally present in everyone, although in a lesser degree, that those who have these powers developed are the ones who dominate the world, and that mediumship is a mode of progression, an evolution towards a new sense, the attainment of which is to be one of the great aims of mankind. The cases described in the earlier part of this book merit the closest study by those interested in a subject generally regarded as lying almost beyond the pale of science, although we may not be prepared to follow the author into all the tortuous by-ways whither he would lead us.

W. BOYD.

**DREAMS AND MYTHS: A STUDY IN RACE PSYCHOLOGY.** By (257) KARL ABRAHAM. Translated by WILLIAM A. WHITE. Nervous and Mental Disease Monograph Series, No. 15. Pp. 74. \$1.00.

TEN, or even five, years ago it would have been somewhat startling to find a volume with this title being published in a neurological series, and the occurrence may be taken as an indication of the remarkable extension of the field of psychological medicine in this time. Detailed studies of the phantasies that make up the pathological manifestations of the neuroses and insanities have shown that these bear the closest resemblance to other products of the imagination that at first sight seem to be only very distantly related to them. The first of these allied fields to be investigated was that of dream life, our knowledge of which is now, thanks to the researches of Freud, in an advanced stage. That of other fields, such as the present one of mythology, is much less complete, partly because the data are less easily controlled objectively so that progress has to be particularly cautious. Abraham's volume, which appeared some four years ago, was one of the first publications on the subject, *i.e.*, of the application of psycho-analysis to mythology, and since then much more extensive studies have been published. Nevertheless it still serves as probably the best

introduction to the problems, and also affords an excellent mode of approach to the general Freudian views with their bearing on the mental life of both the individual and the race.

White's translation, though possibly a little too literal, is very well done, and can be relied on to give the correct sense in an unusually lucid style. The book should be of great value for the purposes indicated above.

ERNEST JONES.

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*Juristisch-psychiatrische Grenzfragen*, Bd. ix., H. 1, 1913. Carl Marhold, Halle a. S., 1913. Pr. M. 1.20.

"Über die Zurechnungsfähigkeit."

I. Engelen, O. "Behandlung der sogenanniten vermindert Zurechnungsfähigen."

II. Kahl Wilhelm. "Der Stand der europäischen Gesetzgebung über verminderte Zurechnungsfähigkeit."

III. Mezger, E. "Die Klippe des Zurechnungsproblems."

Schefold and Werner. "Der Aberglaube in Rechtsleben."

*Juristisch-psychiatrische Grenzfragen*, Bd. viii., H. 8, 1912. Carl Marhold, Halle a. S., 1912. Pr. M. 1.50.

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*The Training School*, Vol. x., No. 2, April 1913.

# **Review** of **Neurology and Psychiatry**

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## **Original Articles**

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### **MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM: THEIR STRUCTURE AND HISTOGENESIS.**

By the late **ALEXANDER BRUCE, M.D., LL.D., F.R.C.P.E.**; and  
**JAMES W. DAWSON, M.D.** (*Carnegie Research Fellow*).

*(Continued from page 255.)*

#### **(2) THE HISTOGENESIS OF NERVE FIBRES IN REGENERATION.**

It has long been recognised that the manner of regeneration of any tissue follows very closely its first development, *i.e.*, that the first stage of each newly produced anatomical element is an embryonal one, and this undergoes successive transformations. We would thus expect to meet with the same diversity of views regarding the origin of the new-formed fibres in regeneration of a nerve after section as we found in regard to its embryogenesis. The possibility of connective tissue cells, in virtue of some mysterious adaptation, taking over the role of embryonic nerve cells, and forming new nerve fibres, is too improbable to be discussed. We therefore pass at once to state the two main opposing views:—

1. The classical teaching is that a budding of the axis-cylinder takes place from the last preserved segment of the central end. This corresponds to the central budding or outgrowth theory of development, and has also been named the monogenist, or unicellular, or centralist view.



2. The newer teaching is that regeneration takes place by means of the differentiation of new-born cells which have arisen from the proliferation of the sheath of Schwann nuclei. This corresponds to the cell-chain theory of development, and has also been named the autogenist, or multicellular, or peripherist view.

We may here note that though complete agreement has not by any means yet been reached, a certain accord, as we shall see later, has been attained. Many centralists have yielded the ectodermic origin of the sheath of Schwann cells, thus eliminating the most serious objection that mesodermic element shared in the regeneration of nerve fibres; they have also allowed the constant presence of cell-chains in regeneration, denying only the actual genesis of the nerve fibres from them. The peripherists, on the other hand, whose common standpoint is the conception of the peripheral genesis of the nerve fibre, have nearly all conceded that the ultimate differentiation comes only after the establishment of a connection with the centre.

Waller, in 1851, communicated to the *Academie de Science* the first facts regarding the secondary degeneration of peripheral nerves after section, and the term "Wallerian degeneration" is a permanent record of this historical fact. He also enunciated the law of the dependence of the nerves for their nutrition on trophic centres. Waller believed that the new nerve fibres in regeneration are formed as outgrowths from the central end, and that regeneration could occur only when the peripheral end was joined to the central end. Phillipeaux and Vulpian, in 1863, showed that a distal end separated from the centre could regenerate, and also that a portion of a nerve transplanted under the skin of another region contained nerve fibres after six months. They believed that the axis-cylinder was not destroyed during degeneration, and that regeneration consisted simply in a re-accumulation of the myelin. Neumann (1868) maintained that during degeneration the axis-cylinder and the myelin of the nerve fibre were only modified chemically, and that they fused into a specific nucleated protoplasmic substance which retained in some form the actual nervous elements.

Ranvier (1871) maintained, on the contrary, that the actual nervous elements disappeared *in toto*. He definitely placed the theory of budding from the central end on a firm basis by showing that the new fibrils are formed by a longitudinal division of the axis-

cylinder of the preserved central end. These newly formed fibres reach the distal segment and pass into the old preserved sheaths of Schwann. For nearly twenty years this view was generally accepted, and Vulpian himself, admitting that possibly branches of nerves in the vicinity took part in the regeneration in the distal end, withdrew from his former position.

In 1891 Von Büngner's fundamental memoir marked a new phase, for he demonstrated the practical significance of his findings. Clinical observation, which had stimulated interest in this line of research, seemed to indicate that the time required for such a process as budding was not in accordance with clinical experience. This was specially the case in secondary suture, where the rapid return of sensation and the re-establishment of conductivity seemed to indicate the re-union of the nerve. Von Büngner, using aniline dyes, asserted that the nerve fibre did not degenerate, but was simply transformed into a nucleated protoplasmic band (*Axialbandfasern*), or into individualised fusiform cells which arose from the mitotic division of the nucleus of the sheath of Schwann. These spindle-shaped cells unite end to end as in embryonal development, and again take the form of protoplasmic bands. The proliferated and enlarged nuclei group themselves in the direction of the fibres, and the homogeneous protoplasm lying between them soon assume a fibrillar striation—the commencing axis-cylinder formation. Von Büngner has, therefore, modified and completed Neumann's view, and his work in turn has been completed by Durante, who has shown that the so-called Wallerian degeneration is really the formation of these *Axialbandfasern* of Von Büngner. To this process Durante has given the name of "cellular regression," as it is due to the abnormal activity of the nucleus and the undifferentiated protoplasm of the interannular segment, which, when the differentiated substances have disappeared, take on a vegetative activity. The protoplasmic or plasmodial bands have thus arisen from the mitotic division of the sheath of Schwann nucleus and the augmentation of the protoplasm, while if each nucleus surrounds itself with protoplasm and individualises, instead of a plasmodial nucleated band we get the formation of fusiform cells.

During the ten years following Von Büngner's fundamental work, a very marked tendency set in towards this new teaching, and so much did the peripherist view seem destined to replace

the outgrowth theory, that many writers did not hesitate to speak of the death of the old view, and by implication the death of the neurone doctrine. The writers whose names must be mentioned during this decade are, with one or two exceptions, peripherists.

Stroebe (1893) strongly opposed Von Büngner's views. By a new axis-cylinder staining method he showed that the peripheral end and the intervening scar-tissue were neurotised by young fibres which passed from the old axis-cylinder. His contribution to this subject, in addition to the introduction of the aniline blue and safranine staining method, was his insistence on the completely passive role played by the peripheral end as a conducting path or scaffolding for the young fibres.

Galeotti and Levi (1895) studied the regeneration of nerves in the newly formed tails of salamander. The tails were cut off in sunny weather, and new tails grew in about fourteen days. These cold-blooded animals were chosen because it was found that in mammals the inflammatory reaction was so intense as to make it impossible to distinguish between the young neuroblasts and the cells which had arisen from the proliferation to Henle's sheath, the epi- and peri-neurium, or immigrated leucocytes. Galeotti and Levi found among the newly-formed muscle fibres more or less long chains of slender elongated cells, the chain usually ending in a cluster of radiating similar cells. The cells of the end cluster in their turn proliferate, elongate, and gradually become arranged in a chain amongst new muscle fibres. In the cytoplasm of each cell, by means of the gold chloride method, a granular filament could be recognised, and as this increased in amount the nucleus was pushed more and more to one side. This differentiation could often be observed in different stages in the same chain of cells. At first every element retains its individuality, then the processes of each cell unite in an imbricating manner and fuse to form nucleated bands which show a bulging opposite the nucleus. The granular filaments of each original cell unite when the cell borders disappear. The outer layer becomes condensed and forms a definite membrane to the band—the later sheath of Schwann. Specific myelin sheath stains were not used, but its development could be followed by means of aniline dyes which showed the double contour and constrictions of the fibres.

The authors were convinced that these fusiform elements, in which the granular filaments form, arise from the proliferation of the nucleus of the sheath of Schwann. In the salamander the connective tissue cells could be easily distinguished from these cells, and there were few connective tissue elements and immigrating leucocytes between the developing muscle fibres. It is important also to note that the regeneration of the nerve fibres was later than that of the muscle fibres, so that the neuroblasts could not be confounded with the developing myeloblasts. The authors finally refer to the remarkable analogy between nerve fibre and muscle fibre regeneration; an analogy to be emphasised by Durante and Lustig. Galeotti and Levi later traced the development of muscle fibres and nerve fibres in the tail of newly hatched lizards, and found that regeneration had proceeded along lines exactly comparable to the stages in the first development.

Kennedy (1897-1904), in the microscopic examination of portions of nerves removed previous to secondary suture, found in both central and peripheral ends irregularly arranged groups of nerve fibres. The fibres cut longitudinally showed a delicate axis-cylinder in the centre, a granular deposit of myelin around it, a homogeneous protoplasm zone around the myelin, and oval nuclei arranged at intervals. The transversely cut fibres appeared as clearly defined circles, each containing an axis-cylinder in the centre and many with an attached nucleus. The arrangement of the bundles was very irregular, and there were found transversely cut bundles with longitudinal and oblique fibres coursing around them. The enormous number of spindle-shaped nuclei amongst the nerve fibres indicated that these elements had arisen by proliferation from the nucleus of the sheath of Schwann, and Kennedy believes that these new nerve fibres in the peripheral stump of a still-severed nerve—showing axis-cylinder and commencing myelination—could have arisen only from the nucleus and protoplasm of the interannular segment, which must therefore be regarded as a neuroblast. Further steps to complete differentiation of the nerve fibre probably depend on a restoration of continuity. A fibre may remain in this incompletely differentiated stage for a very long time, and this resting-stage, as it were, affords an explanation of the very rapid return of sensation after secondary suture, for the nerve path is practically ready to transmit impulses, and needs little further differentiation.

Ballance and Stewart (1901) have made a very thorough histological investigation of the process of regeneration in nerves after section, both with and without suturing of the proximal to the distal segment, and also of the changes which occur in nerve grafts. The experiments were carried out on monkeys, dogs, and cats, and the histological methods used were very complete:—Weigert's medulated sheath stain, the Golgi and Stroebe methods for axis-cylinders, and Van Gieson's method for cellular and protoplasmic structures. The neurilemma cells commenced to proliferate on the second day after section; the resulting cells preserved the longitudinal direction of the parent cell, and from their opposite poles sent out fine protoplasmic processes. These proliferated neurilemma cells play only a transient rôle in the absorption of the fatty débris of the degenerated myelin, and the chief part in phagocytosis is carried out by immigrated cells from connective tissue and blood.

The proliferated neurilemma cells in both central and distal ends take on an active neuroblastic function. They secrete short lengths of axis-cylinder which increase in length and diameter, and the imbricating ends fuse together to form a continuous axis-cylinder. Ballance and Stewart were able to assure themselves that the neuroblasts, demonstrated by the Golgi method shooting out beaded axis-cylinders from opposite poles, were identical with the proliferated neurilemma cells, which, with Stroebe's method, showed the earliest stage of a new axis-cylinder as a deposition along one side of the cell. The Stroebe method showed axis-cylinder intensely blue against a pink background. The new myelin sheath is also laid down by a process of secretion along one side of a spindle-shaped neurilemma cell, probably being wrapped round a pre-formed axis-cylinder. It grows in length, shows like the axis-cylinder a beaded appearance, and ultimately anastomoses with adjoining sheaths. The beaded appearance of the myelin sheath is due to the presence of the nucleus of the cell in which it is developed: as the sheath grows in size the nucleus becomes less conspicuous, and finally can be found only in each internode. Within a graft the neuroblasts are developed from the proliferation of neurilemma cells of the proximal and distal segments. They travel into the graft alongside the blood-vessels, for the embryonic sheaths are found in greatest abundance in the immediate vicinity of the vessels. The graft is therefore a scaffolding invaded by

neurilemma cells, predisposed to assume a longitudinal direction, within which new axis-cylinders and myelin sheaths are secreted.

The difference between the changes which characterise regeneration in a re-united nerve, and in the distal segment of a non-united nerve is one merely of degree and not of kind. Even in the latter case regeneration of the axis-cylinders and the myelin sheaths takes place, although full maturity of the nerve fibre is not attained unless the distal segment be joined to the proximal, so that their fibres may become functionally continuous. In both axis-cylinder and myelin sheath the beaded stage is apparently the limit of development in cases where functional conductivity is not re-established.

Ballance and Stewart are convinced upholders of the view of the multicellular structure of the peripheral nerve fibre and of the neuroblastic function of the neurilemma cells. They believe that the peripheral nervous system is to be considered as made up of a chain of cells, and further, that the activity of one variety of cell, and one variety only—the neurilemma cell—is responsible for the regeneration of a peripheral nerve, not only for its axis-cylinder, but also for its myelin and neurilemma sheaths.

Bethe (1901-1907) is at present the most prominent and strenuous supporter of the peripheralist theory, and his work since the beginning of the century has formed the main point of attack of the centralists. After a very complete series of experiments, which has seemed to exclude every possible fallacy, he sets himself to answer the following questions:—Can regeneration be purely central? Or purely peripheral? Or does it rest upon a co-operation of both central and peripheral influences? If this last, how can the share of each be determined? It is impossible to give a complete review of his numerous articles, in which answers to these questions are given with the most elaborate detail. We endeavour to present only the main conclusions and hint at how they were reached. (1) The ganglion cell of the anterior horn, deprived of its axis-cylinder process, cannot form a new nerve process if it is not in connection with a cell of the sheath of Schwann. All experiments which seem to prove this had always left a considerable part of nerve root with attached Schwann cells, so that it was impossible to state how much was to be put down to the central cell and how much to the Schwann cell. Bethe severed the anterior nerve bundle just within the pia, thus leaving no sheath

of Schwann cells, and found that the ganglion cells never produced a new axis-cylinder process. If any sheath of Schwann cells were left, *i.e.*, if section was extra-medullary, Bethe found that small neuromata developed in the pia, and that this production was more marked the further from the cord section had taken place. Therefore the central end alone cannot produce a new axis-cylinder process, and the production of the new nerve is in the first degree the function of the Schwann cells. (2) In young animals nerve fibres permanently severed from their trophic centre, *e.g.*, by the excision of 4-6 cm. of the nerve trunk, regenerate autogenously and become capable of excitability and conductivity. Bethe enclosed the upper end of the distal segment of the cut nerve in a capsule, and in several other ways avoided the possibility of a connection of the peripheral with the central end. He therefore concluded that in young animals the peripheral end could regenerate autogenously. In adult animals he admitted that regeneration never went beyond the stage of protoplasmic bands, *Axialbandfasern*, or embryonic fibres, unless union with the central end was effected. He is convinced, however, that the growth of the axis-cylinder and myelin sheath in these embryonic fibres is definitely a cell differentiation and not an outgrowth from the central end. Bethe's searching criticism of the centralist's position must be very carefully considered by anyone taking up an opposite opinion. It has seemed to us that none of those who during the past ten years have sought to answer his objections have sufficiently recognised the pains he has taken to fulfil the very conditions they have themselves laid down as essential. We can mention only one or two out of many points which Bethe has emphasised. Cajal and Perroncito, as we shall see later, show that Schwann cells form the outermost part of the bulbous end of the young central axis-cylinder, and yet claim this fact as supporting the outgrowth theory. Bethe explains this as a regeneration proceeding from the proliferation of the last-preserved Schwann cells nearest the point cut through. Again, the impossibility of the functional reunion of motor and sensory fibres, also of pre-ganglionic and post-ganglionic fibres, proves that the remains of the nerve fibres retain, after degeneration is accomplished, a certain degree of their specific function. This is against the indifferent character attributed by the centralists to the cells of Schwann sheath.

Fleming (1902) holds an opinion which he describes as midway between that held by the central and peripheral theorists. In numerous sections from the peripheral ends of divided nerves in rabbits—"nerves so divided that all regeneration from the central end was prevented by every possible means"—he found what he believed to be a limited peripheral regeneration of axis-cylinders. The neurilemma nuclei were proliferated and had formed chains, and definite young axis-cylinders had appeared in connection with these neurilemma nuclei which, in consequence, he looked upon as neuroblasts. The immature axis-cylinders tended to join on end to end with other axis-cylinders to form nerve fibres. Similar changes were found in portions of the sciatic nerves of rabbits divided, proximally and distally, by double sutures. These appearances were not seen until twenty days had elapsed after section or suture. These peripherally formed nerve fibres, or at least axis-cylinders, do not become myelinated or capable of functioning until they are joined on to the central segment—in other words, to their central and trophic neurones.

Fleming also accepts central regeneration and has often seen evidences of it, but he does not and cannot believe that central regeneration alone can ever explain the phenomena of secondary nerve suture. No explanation given by the centralists of those undoubted cases in which conduction of nerve impulses followed within a few days of secondary suture seems to him reasonable or possible.

Langley and Anderson (1904) have objected to the conclusions of Kennedy, Ballance and Stewart, and other autogenists, on the ground that there is no satisfactory evidence in their experiments that the peripheral end of a nerve, remaining ununited with a central end, had not united with the nerve fibres of the central end of other nerves cut through at the operation. They carried out a series of experiments to settle this point, and found that, when the peripheral end of a cut nerve was sewn into the skin or left lying amongst muscles, it made connection with the central nervous system by means of the nerves of the surrounding cut tissue, although it made no connection with its own central end. They have demonstrated that all the medullated nerve fibres which reform in the peripheral end of a cut nerve degenerate when the nerves which run to the surrounding tissue are cut, or when the original nerve is again cut across on the central side of the



original point of section. They have further noted that the number of medullated nerve fibres found in the peripheral end of a cut nerve is very variable: a fact easily explained by the naturally varying connection with the central nervous system, but not explained by the autogenist view. It will be remembered that the difficulty in proving the absence of central connection with neighbouring nerves was the determining factor which led Vulpian to give up his earlier position.

Langley and Anderson conclude from their experiments that the peripheral ends of cut fibres exercise a chemiotactic influence on the central ends, and that this chemiotactic influence has numerous gradations, *e.g.*, it is greater between fibres of one class, as it is well known that afferent fibres of one nerve can unite with the afferent fibres of another, but they cannot unite with the afferent fibres so as to produce any functional result. The evidence is still insufficient to show whether nerve fibres giving rise to one sensation can unite with the fibres giving rise to another sensation.

Mott, Halliburton, and Edmunds (1904-1906) have also exposed what they consider the fallacy underlying the work of Kennedy, Ballance and Stewart, and others. Their own experiments were carried out in such a way as to obviate the possibility of new nerve fibres "finding their way by devious channels" into the peripheral stump. The incisions were very small, and the upper end of the distal segment of the cut nerve was enclosed in a capsule of sterilised guttapercha. After 100-150 days there was found no response of any kind to stimulation, and the microscopic examination of the peripheral end showed no trace of regeneration, and in many parts no nervous structure could be recognised. Two of Vulpian's experiments were repeated, one in which the segments of nerve were transplanted to a part devoid of nerves, *e.g.*, the peritoneal cavity, and no autogenous regeneration could be proved; the other was an experiment in which the nerve was again cut across on the peripheral side of the original site of section, and it was found that the degeneration took place solely peripheral to the second section. As it was assumed that the direction of regeneration is always the direction of growth, this experiment proved that the growth of new fibres had started from the centre peripheralwards, and not in the reverse direction.

It is, however, admitted that the activity of the neurilemma

cells has some definite relation, perhaps nutritionally, to the development of new nerve fibres; that the proliferation leads to the formation of what seem embryonic fibres; but that this is only the scaffolding for the axis-cylinder, which has an exclusively central origin.

Kennedy has criticised the objections raised by these observers and also by Langley and Anderson to his experiments and those of Ballance and Stewart. He thinks that the possibility of fibres from surrounding cut nerves growing into the distal end is a far-fetched explanation, and that it assumes an extraordinary affinity between young nerve fibres and the old nerve trunks—an affinity which, if it existed, would assure spontaneous union after accidental division. Kennedy also, referring to the doubt that Mott, Halliburton, and Edmunds throw on the very early return of sensation after secondary suture, explains the care with which the clinical facts of the return to conductivity and sensory impulses are ascertained.

Head and Ham (1904) have shown that an ununited distal end may remain in the "resting stage" (Kennedy) for 540 days if the blood supply is sufficient. If even then united to the central end, it is completely restored. Shortly after union the spindle-shaped cells lengthen, form definite fibres, and are able to conduct stimuli to the central nervous system—even before axis-cylinder and myelin sheath can be demonstrated histologically. The first axis-cylinders and myelin sheaths are well formed, yet are thin and stain lightly, but later they stain deeply with specific stains.

Head, Rivers, and Sherren (1905).—As this paper deals chiefly with histological data, we can only briefly refer to the important clinical investigations of Head, Rivers, and Sherren. These observers state that the return of function and sensation in man, after secondary suture, coincides closely with the data obtained in animals for the re-appearance of new and fully-formed fibres. They think that earlier observers, who had deduced from a rapid return of sensation the presence of pre-formed fibres, had been led into error by the vague nature of certain kinds of sensation.

Barfurth (1905) has carried out a series of sections of the sciatic nerve of the dog, and has come to conclusions almost identical with those of Bethe. He criticises Langley and

Anderson's acceptance of the presence of degeneration in the distal end after a second excision in the central stump as a proof of the ingrowth of fibres from the centre. He shows that this occurred in Langley and Anderson's experiments only after 119-737 days, and remarks that surely some central fibres could in that time grow into the peripheral end. In his own experiments a second portion was excised 69 days after the first excision, and no trace of degenerated fibres could be found in the peripheral stump. His conclusions are that in favourable circumstances a regeneration of nerve fibres can take place in a peripheral nerve cut off from its central end, that this can go on to all the essential constituents of the nerve (axis-cylinder, myelin sheath, and neurilemma sheath), and that it takes place essentially by means of the nucleus of the sheath of the Schwann cells. His closing words are too interesting to omit quoting: "These nuclei can therefore be no plebeian mesenchyme cells, but are neuroblastic elements of aristocratic ectodermic nature."

Lapinsky (1905) also supports the peripherist view. His contribution to this question is twofold: firstly, he shows that the regeneration in the central end is emphatically the same as that in the peripheral end—a point not quite so clearly brought out by previous writers; and secondly, he draws a marked distinction between autochthonous regeneration and neurotisation. In the former case the newly arising axis-cylinders remain unconnected with the centre, and microscopically they are very thin, show no fibrillar differentiation, have no resisting power, and soon degenerate; the myelin sheath also develops only incompletely and soon degenerates. In neurotisation the peripheral end is connected with the centre; there is therefore complete myelin sheath and axis-cylinder differentiation and complete functioning power. "Obviously through this connection with the anterior horn cells the sluices are opened to the special stimuli which supply to the regenerated tissue its complete structure."

Raimann (1905) and Lugaro (1905) have used the most radical methods to exclude the influence of the centre. Raimann, in newly born dogs, removed the spinal cord from the 2nd lumbar segment downwards together with the spinal ganglia as far as possible. In the single dog surviving out of seven operated upon, in the sciatic nerve on the right side, which, of course, had been

left untouched in its bed of tissue and in which, therefore, there could be no ingrowth of fibres from the neighbouring tissue, he found so large a number of fibres that they could not be explained except by regeneration. He drew the conclusion that the cells of Schwann's sheath had produced a second nerve tube, which however, he admits leads a transitory life. Lugaro, in adult dogs, removed the whole lumbo-sacral cord and spinal ganglia, thus including the nuclei of origin not only of the sciatic nerve but also of the crural and obturator nerves, and three months later he found no regeneration. The sheath of Schwann cells had arranged themselves in protoplasmic bands, but these contained neither axis-cylinder nor myelin. There were present fine axis-cylinders, so numerous that they seemed to speak in favour of autogenous regeneration, but Lugaro assumed that they were sympathetic fibres. In one dog, therefore, he completely severed the central end of the sciatic from its connections with the sympathetic nerves, but he left the sympathetic attachments to the obturator and crural nerves. By means of Cajal's reduced silver method, a hundred days after the operation, he was able to demonstrate large numbers of axis-cylinders in the obturator and crural nerves, but none in the sciatic nerve.

Modena (1905), Munzer and Fischer (1905), Von Krassin (1906), and Besta (1906), must be mentioned amongst those whom Bethe's results stimulated to an experimental endeavour to solve this difficult question. Modena and Besta relate the development of the new fibres to the Schwann cells, but insist on the necessity of the central influence for their complete differentiation. The others are centralists. Von Krassin used the intravital methylene-blue method of Ehrlich, up till then scarcely applied in the study of regeneration.

Marinesco (1905) performed section of the sciatic and crural nerves both in newly-born and adult animals. He states that reunion of cut ends is not essential to regeneration, and that this can arise in both central and peripheral ends through the proliferation of the sheath of Schwann cells. The details are those which we have seen in Von Büngner's work: the formation of fusiform cells and protoplasmic bands with at first fine, almost invisible, lines within the cell protoplasm; later, thicker black lines stained with Cajal's silver method and the development of the myelin sheath and sheath of Schwann. An illustration given

by Marinesco in this paper is a very striking proof of the spiral formations having arisen within cells. Around an old axis-cylinder of the central end coils spirally a thin fibre, and the components of the spiral are within cells in the protoplasm of which they have developed: the cells are arranged transversely to the old fibre.

In the following year, however, Marinesco and Minea carried out a new series of experiments which led Marinesco to change his views on autogenous regeneration. Both authors look upon the cells within which the axis-cylinders were thought to have developed only as an advance guard to provide for the nutrition and orientation of the new fibres. They attribute the young fibres to outgrowths from the central end, the axis-cylinder of which, by longitudinal dissociation, has formed fibrils, each of which terminates in a *cone de croissance*. Collateral division of the central end axis-cylinder may also take place, and such collateral fibres tend to assume a spiral direction round the old fibres. These authors part company from Cajal in attributing no phagocytic rôle to the proliferated cells, which they term *cellules apotrophiques*. In a further series of experiments Marinesco grafted small pieces of nerve into animals of the same and different species. In the homo-transplanted series there was no new axis-cylinder formation, as the apotrophic cells were present only in small numbers, and in the hetero-transplanted series the grafts were entirely removed by phagocytosis on the part of polymorpho-nuclear cells—just as the blood corpuscles of one animal are destroyed by the body fluids of an animal of another species.

Perroncito (1907) divided the sciatic nerve in dogs, and observed, by means of Cajal's reduced silver method, the changes which occur from the very earliest period onwards. He was the first to show that the signs of regeneration described by Cajal occur very early. Twenty-four hours after section Perroncito found traces of collateral and terminal ramifications, and already, in two days, newly-formed fibres which spring from the central stump have reached the scar-tissue and show a very fine fibrillar structure, with end thickenings and terminal balls. He has also described a process of the unravelling of the thickened central end axis-cylinder which precedes the development of the new fibres, an appearance which Cajal has termed "the phenomenon of Perroncito." Axis-cylinders may later grow out as compact

axis-cylinders, become dissociated into fibrils, and unite again into a compact axis-cylinder. On the tenth day after section the connection between the separated ends of a non-united nerve is completed by newly-formed fibres, many of which show forkings with terminal balls. Perroncito also draws attention to the length of time that old axis-cylinders may be recognised in the peripheral stump, and concludes that they are non-medullated or Remak's fibres.

Cajal (1904-1907).—It is impossible in a short review to do justice to the work of Cajal, which has been the source of inspiration to so many. It is the less necessary to attempt this, as many of his beautiful illustrations, showing stages in the regeneration of the axis-cylinder, are reproduced in the more recent text-books, and all are familiar with his terms—*cône de croissance*, *massue de croissance*, and *boules terminales*. As in the early development, so in the genesis of the new fibres in regeneration the work of Cajal was the first that seriously opposed the new teaching that set in with Von Büngner's researches and that seemed destined to replace the outgrowth theory. This reaction in favour of the outgrowth theory must be associated with the names of Cajal, Perroncito, and Lugaro. It need therefore scarcely be added that Cajal's researches have demonstrated that the nerve fibres of the scar-tissue and peripheral end are always formed by growth from the central end. In the peripheral segment near the cut portion, preceding the degeneration of the axis-cylinder, Cajal noted signs of regeneration—indicating that the axis-cylinders do not die immediately that they are cut off from their trophic centres, but that during the short period of their survival they attempt regeneration. By the eighth day all the axis-cylinders in the peripheral segment have undergone a granular degeneration except the fibres of Remak, which resist longer.

In the central end the axons commence to modify on the first day, the first change being a terminal *massue de croissance*, from which filaments proceed; other axons show a reticulated or dissociated appearance. The filaments and the dissociated fibrils increase in length and penetrate the exudate between the cut ends, each filament and fibril having a terminal cone or ring. Collateral intratubular regeneration may also occur, the short collaterals being provided with buds or thin tangential collaterals, more frequently with rings. The collateral fibres tend to form

spirals or groups round the old axon. Cajal has laid great stress on the important fact that during these early stages of degeneration there has been no proliferation of cells within which the young axis-cylinders could develop, but he adds that from the third day onwards each terminal cone appears enclosed by a few cells.

The passage of the new axis-cylinders across the scar-tissue and into the old sheath of Schwann, is regulated by chemiotactic substances elaborated by the proliferated cells of the sheath of Schwann, which have been transformed into the *Axialbandfasern* of Von Büngner. Cajal attributes three functions to the proliferated nuclei: firstly, a phagocytic function; secondly, that of secreting a chemiotactic or neurotrophic substance to attract the young fibres from the central end and guide them into the sheaths; and thirdly, the function of maintaining the nutrition of the young fibres when they arrive. Cajal reproaches all who are in favour of autogenous regeneration with having used methods "unreliable or insufficient." It is impossible to avoid noting here that Lugaro, Perroncito, and Marinesco—on the strength of whose observations, together with his own, Cajal claims that the cell-chain conception has been definitely refuted—have all used only impregnation methods.

Poscharisky (1907), who has used Cajal's and Bielschowsky's silver methods, confirms many of Cajal's observations, but has come to different conclusions regarding the significance of the early phenomena observed in the two ends. While not denying the possibility of growth from the central axon, he looks upon the terminal cones, balls, and rings as signs of a dying condition of the axis-cylinder. He believes that regeneration commences only on the third day, *i.e.*, after the proliferation of the cells of Schwann's sheath is in full activity. He thinks that silver impregnation methods are not sufficient to lead to any definite conclusion, whether the new axis-cylinders have arisen within these proliferated cells, or are outgrowths from the centre.

Margulies (1908) found, after permanently separating the distal end of a cut nerve in the rabbit, that a new tissue arose which agreed in many respects with certain embryonal stages of development, *i.e.*, the *Axialbandfasern* stage of Von Büngner. In the young animal this neurogenous tissue led to a spontaneous regeneration, but in the adult never advanced to completely

differentiated fibres. Margulies, taking his stand upon the fact of the undisputed proliferation of the Schwann nuclei, and on the generally accepted opinion of their ectodermal nature, concluded that under all circumstances an autogenous regeneration takes place even without the influence of the central ganglion cell. It is incomplete, however, till the functional activity of its elements is brought into play, and this can be only when it is anew related to the centre. Even in young animals, where a complete regeneration takes place, the new-formed fibres do not remain long in this complete condition, but tend to reassume the *Axialbandfasern* stage.

Durck (1908), who has made a very exhaustive microscopic investigation of the peripheral nerve in beri-beri, has found in numerous cases a transformation of the nerve fibre into a nucleated neuroplasmatic cylinder, *i.e.*, a cellular regression to the *Axialbandfasern* stage. Segments showing this have become functionally incompetent, but are none the less specific neurogenous tissue. This specific tissue, Durck was convinced, had arisen from the proliferation of the sheath of Schwann cells, and he believes that the changes in the nerves in such conditions as beri-beri form a striking conformation of the multicellular structure of peripheral nerves.

Alzheimer (1910) has studied regeneration in experimentally produced lead neuritis of guinea-pigs and rice neuritis of fowls. In such neuritis the axis-cylinders may remain preserved for a long time after the myelin sheath has not only degenerated, but after the degenerated products have been removed. When the axis-cylinder itself has disappeared, there is found a Wallerian degeneration distally. Alzheimer studied the regeneration which occurred at such a point of the interruption of the axis-cylinder, and found numerous terminal divisions of the old axis-cylinder of the central end, also numerous collateral branches, and that each new fibril ended in a ring or club. These new fibrils grow preferably, but not exclusively, within the intercellular plasmatic bridges of the proliferated Schwann cells. Osmic acid preparations show that these new fibrils rapidly assume a thin myelin sheath. He believes that the sheath of Schwann cells are in the peripheral nervous system the biological equivalents of the glia cells in the central nervous system, and that they play, like glia cells also, only a transient rôle in the phagocytosis of degenerated elements.

Throughout the works on regeneration, we have heard only



faint echoes of the intercellular bridge theory of development in the discussion of the genesis of fibres in regeneration, but we close this section with the work of Alzheimer—a supporter both of the outgrowth and intercellular theories of development.

#### NOTE ON THE REGENERATION OF FIBRES IN THE CENTRAL NERVOUS SYSTEM.

A complete anatomical and functional regeneration of fibres has been proved for the peripheral nervous system. Similar proof is wanting for the fibres of the central nervous system, but there is evidence both from experimental work and pathological conditions that there is a considerable effort at regeneration. In this attempt at regeneration a specially important rôle seems to be taken by the blood-vessels, which act as a conducting path for the new fibres.

Nageotte (1899-1906) has described a special type of regeneration in tabes, which he has designated "collateral regeneration." According to Nageotte, the initial lesion in tabes is a transverse neuritis of both anterior and posterior roots, starting from the point where the nerves pass through the dura mater. In the anterior roots, in addition to the secondary descending degeneration, there is a retrograde degeneration extending to a greater or lesser extent towards the cord, and from the point where this may be arrested there is an attempt at regeneration. If the old sheaths are uninjured the new fibrils grow out into the old sheath, each leash of new fibrils representing a destroyed nerve tube. If the degeneration is arrested just within the pia, and if the old sheath is injured, the new fibres grow into the pial spaces, forming neuroma nodules. The posterior root shows a similar regeneration, but here the fibres are not myelinated. The Weigert stain shows only a few fibres, while Cajal's silver method reveals numerous fine fibrils reaching up to the cord. Nageotte finds it difficult to explain why the posterior fibres of regeneration are without myelin. He states that the new-formed fibres may start from three points: the cell-body, the intra-capsular, and the extra-capsular portions of the axon. The fibres are not terminal, but are actual new processes of the cell or collaterals of the preserved portion of the axon. The term "collateral regeneration" in tabes is thus used. Many of the new fibres even those within the

capsule, may show *cônes* and *massues de croissance*. Similar appearances are found under normal conditions in the posterior root ganglia: in tabes and other pathological conditions there is only an exaggeration of the normal. Nageotte has also carried out a series of transplantations of the spinal ganglia to the peritoneal cavity and other parts of the body, and has found that the change of nutrition has caused the new protoplasmic processes to change in type, *e.g.*, to take on the aspect of the sympathetic. Under these abnormal conditions, the peri-cellular and periglomerular arborisations were also reproduced.

Nageotte states that the regeneration in tabes cannot re-establish function, as the terminal *massues* and *cônes* are arrested at the area of inflammation where the first fibres were destroyed.

Fickler (1900) examined two cases of compression of the cord at the lower dorsal region, in both of which there had been a great amelioration of the cord symptoms for some time before death. He found above the compressed part numbers of fine axis-cylinders, especially in the adventitia of the small vessels of the cord. These appeared first in the vessels at the periphery of the grey matter in the corner where the anterior and posterior horns meet. At a slightly lower level the fibres passed in the vessel walls to the commissural vessels and thence to the vessels in the anterior fissure. Just above the point of greatest compression the fibres filled the anterior fissure and overflowed into the adjoining pia. Opposite the compressed part there were no fibres at all within the cord—all had passed into the anterior fissure and pia. Below the area of compression the fibres, collected into small groups, passed again from the vessels of the anterior fissure to the commissural vessels and were distributed in the grey matter. On their whole course they were surrounded by a sheath of Schwann. Fickler states that these are new-formed offshoots of the fibres of the crossed pyramidal tract above the lesion, which in this way have restored connection between the fibres above and the ganglion cells below the level of compression. In the second case there were present nerve fibres in the posterior septum, which were looked upon as new-formed sensory fibres. Fickler concluded that the nerve fibres of the cord are capable of regeneration, even to the complete restoration of function, as long as the blood-vessel apparatus of the cord is intact. The fibres had arisen by the axis-cylinder breaking up into its

primitive fibrils; one axis-cylinder could therefore become connected with several ganglion cells below the point of compression. In a recent paper Fickler considers that the new-formed fibres were derived, not from the pyramidal tract above the lesion, but from the ganglion cells of the grey matter and of the spinal ganglia. The appearance of the sheath of Schwann, as soon as the fibres enter the vessels, argues in favour of the mesodermic nature of the sheath of Schwann. Bikeles (1904), in a case of rupture of the cord, where the patient survived ten months after the injury, found a certain amount of regeneration. Continuous with the regenerated fibres of the proximal portion of the posterior root, there were present very delicate irregular fibres in the posterior columns, though no other nerve fibres were present. Clark (1906), after section of the cord, noted that regeneration is limited solely to fibres of peripheral character. He thinks, therefore, that the cells of the sheath of Schwann are necessary to regeneration.

Bielschowsky (1906-1909) has made a very careful examination, by the aid of his new silver method, of the axis-cylinder formations found within tumour nodules in the brain and cord, and in the zones bordering areas of compression in the cord. His investigations have confirmed him in the conviction of the capability of regeneration of the central nerve fibres. The numerous fine fibres ending with rings or button-shaped swellings, and the fact that similar fibres were found in the vessel walls, especially of the marginal zones—could, he thought, be nothing else than a new formation of fibres. In the white matter of the cord the new fibres were present in a direction corresponding to the fibre systems of the cord displaced by the tumour, and had arisen from the dissociation of old nerve fibres persisting within the tumour mass and of fibres of tracts interrupted by the tumour. In a case where the posterior nerve roots were penetrated by cancer cells, and Weigert's medullated sheath stain showed empty nerve tubes, Bielschowsky found in the transition zone between healthy and diseased parts very fine fibrils with exactly similar appearances growing from the stump of the interrupted fibres. The collateral regeneration of Nageotte, found in tabes, must be related to the influence of the ganglion cell, though it is admitted that the capsule cells and the cells of Schwann's sheath take their share in the formation of the new fibres. Bielschowsky,

in opposition to Nageotte, holds that it has not been proved that the fibrils represent the most essential constituent, but thinks rather that they must be looked upon as supporting axes for the conducting neuroplasm.

Bielschowsky concludes that for the regeneration of the fibres in the central nervous system two factors are essential; the one, sufficient vascularisation; the other, the presence of special decomposition cells. Such cells may possibly exert a chemiotactic influence, but more likely, by means of their syncytial connections, exercise a plastic function as pre-formed cell bridges. They have, therefore, the same significance as the proliferated sheath of Schwann cells in the regeneration of peripheral nerves. Bielschowsky thus declares himself to be a supporter both of the outgrowth and intercellular bridge theories of development.

Marinesco and Minea (1906-1909) have looked for evidence of regeneration of central nerve fibres in cases of experimental section of the cord in dogs and in compression of the cord in man. They believe that a certain amount of restoration may take place through the formation of new fibrils, but that this can rarely go on to functional restoration, as the re-establishment of the inter-neuronal connections of the new fibres would be almost impossible. Both in experimental and pathological conditions fibres of new formation can pass into the cicatrix from both upper and lower ends. The new fibres are of fine calibre, show moniliform swellings, and end in *cônes* and *massues*. They are derived, as in peripheral nerves, from the dissociation of the preserved axis-cylinder with successive ramifications: collateral branches may also be given off, and these divide and ramify. The vessels, especially at the periphery of the cord, are surrounded almost with a plexus of new fibres.

Marinesco and Minea attribute an important rôle to the presence of the *cellules apotrophiques* which are found in the tissue between the interrupted fibres. These are fusiform cells which frequently form protoplasmic bands as in the peripheral nerves. They have chemiotactic and nutritive properties in relation to the new fibres which may be found even within the protoplasm of the cells. Cajal has stated that in hemisection of the cord in cats the new fibres atrophy in consequence of the absence of cells capable of secreting a chemiotactic substance. Marinesco has also described the neurotisation of areas of cerebral softening, tubercular and

syphilitic nodules, and gliomas by means of bundles of fine fibres which form a reticulum around the lattice and tumour cells or within the vessel sheath. Here again there can be no functional restoration, and there is no intimate relation between the new fibres and the actual elements of new formation to register a symbiosis.

Miyake (1908), using Cajal's silver methods, compares the changes of the axis-cylinder in pathological processes and in experimental sections of the cord. He found at the margin of cerebral tumours vacuolation and terminal varicose swellings of the axis-cylinders. Such swellings often showed the dissociated fibrils ending in rings and buds. In a sarcoma of the dura, which had no association with the brain, similar appearances were found in the vessels. To determine whether the above changes were degenerative or regenerative Miyake carried out a series of experimental sections of the cord in rabbits. In the necrosed zone and the zone of reaction the axis-cylinders showed terminal swellings and vacuolation, but adjoining the healthy zone there was a dissociation of the axis-cylinder into fibrils with terminal cones—probably regenerative. The author has come to the conclusion that only terminal buds and rings following a fine axis-cylinder can be looked upon as signs of regeneration, and that even these must be accepted with great caution, as they were found in the dural sarcoma.

Rossi (1909) found, in aseptic hemisection of the cord in young rabbits and dogs, that there was a very manifest production of new fibres which pass the zone of degeneration of both stumps, reach the cicatricial zone, and are there arrested by the proliferation of the supporting elements. After intra-cranial section of the optic nerve the fibres in connection with the central (retinal) cells show during the first month considerable regenerative activity. Rossi holds that fibres separated from their central cells could not regenerate spontaneously.

Perrero (1909) considers that the question of the regeneration of the fibres of the central nervous system may be counted as solved, thanks to the methods of Cajal and Bielschowsky. By means of these methods it is possible to avoid the fallacy which underlay previous observations of those who used methods which stain axis-cylinder and glia-fibres alike. Perrero examined the cord from a man who died with symptoms of complete transverse

lesion 29 days after fracture of the 5th and 6th cervical vertebræ. Immediately above and below the completely softened segments of the cord, corresponding to the injured vertebræ, numerous formations were found which were regarded by the author as undoubted phenomena of regeneration, *e.g.*, divisions of fibres, cones, rings, and balls. From some of the terminal balls fine black threads could be traced; other axis-cylinders were found dissociated into fibrils which frequently formed a plexus formation around the vessels. These appearances were noted especially in relation to the pyramidal fibres of the cord above the lesion and to the posterior columns and posterior roots immediately below the lesion. The regeneration was not sufficient to pass through the zone of softening.

(To be concluded.)

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## Abstracts

### ANATOMY.

**THE CENTRAL FISSURE OF THE CEREBRUM.** J. SYMINGTON and (258) P. T. CRYMBLE, *Journ. Anat. and Physiol.*, Vol. xlvii., April 1913, p. 321.

SYMINGTON and Crymble, from an examination of almost 150 human brains, propose a new description of the surface form of the central or Rolandic fissure. They have relinquished the term genu as there are five genua in the typical fissure, and the term has been frequently used in a vague and indefinite manner.

The curves of the fissure are due to the formation of two buttresses on the anterior wall, a medial or upper buttress ( $B_1$ ), and a lateral or lower buttress ( $B_2$ ). Between  $B_1$  and the longitudinal fissure, the central fissure is directed backwards and inwards, while below  $B_2$  is a vertical terminal portion, measuring 1 to 2 cms. in length.

These buttresses are often well marked in foetal brains, and have been observed as early as the sixth or seventh month. Nineteen out of twenty-three children's hemispheres exhibited them.



In connection with the lateral half of  $B_1$  there is an elevation of the fissure floor, the ascent to the highest point of the elevation being much steeper when approached from the lateral aspect. Its lateral limit is, therefore, more easily defined than its medial limit. The histological researches of Campbell have shown that the precentral gyrus at this elevation contains the centres for the trunk muscles. When one applies our knowledge of motor localisation to this typical central fissure, the following results are obtained.

1.  $B_1$  is a leg-trunk buttress, the medial end of the floor elevation defining the leg-trunk junction, and the lateral end defining the arm-trunk junction.

2.  $B_2$  is a pure arm buttress, its junction with the head and neck being marked by the sharp bend of the fissure at the upper end of the vertical terminal piece.

3. The terminal vertical piece, 1 to 2 cms. long, limits posteriorly the head and neck region.

The most common distance of the various junctions from the median end, measured directly, are :—

Leg-trunk junction	-	-	-	3 to 4 cms.
Trunk-arm junction	-	-	-	4 „ 5 „
Arm-face junction	-	-	-	7 „ 8 „
Total fissure	-	-	-	8 „ 10 „

AUTHORS' ABSTRACT.

#### THE POSTERIOR LONGITUDINAL BUNDLE: AN ANATOMICAL (259) STUDY. (*Etude anatomique du faisceau longitudinal postérieur.*)

A. VAN DER SCHUEREN, *Le Névrase*, Vol. 13, F. 2, 3, April 1, 1913, pp. 183-309.

THE experimental part of this comprehensive research was performed on rabbits, kept for from five to fifty days: certain points were verified on cats. The methods used were chiefly (1) that of combined degenerations—chromolysis and direct Wallerian—and (2) van Gehuchten's indirect Wallerian degeneration method. As many as eighteen separate experimental sections at various levels were performed. The histological methods used were those of Nissl, Pal, and Cajal. The author divides the fibres of the P.L.B. into two groups, (a) those of non-vestibular origin, (b) those of vestibular. His conclusions are here given :—

##### *A. Non-Vestibular Fibres of Posterior Longitudinal Bundle.*

1. *Fibres rising in Mesencephalic Reticular Cells.*—In the proximal part of the mesencephalon the P.L.B. receives a strong

contingent of descending fibres, generally direct, which rise in scattered cells, not grouped in definite nuclei, and are distributed at various levels of brain and cord: the largest of these cells send their axons to the sacral cord, the smaller cells to various levels of the brain-stem: the larger cells are generally homolateral, the smaller both homo- and heterolateral.

2. *Fibres rising in Peri-Aqueductal Cells.*—The P.L.B. receives both the crossed and direct fibres of some of the cells of Kohnstamm's intra-trigeminal nucleus, and the direct fibres of the ventral cells of Kohnstamm's intra-commissural nucleus. (The dorsal cells of the latter nucleus send their axons into the posterior commissure. The author concludes that Kohnstamm's intra-trigeminal nucleus gives origin to two systems of descending fibres: (a) direct fibres which form Probst's bundle, (b) both crossed and direct fibres which enter the P.L.B. and the predorsal bundle. He failed to get any chromolysis in the intra-trigeminal cell-group after section of the upper cervical cord (Kohnstamm's), and he also failed to trace Probst's bundle into the dorsal vagus nucleus: apparently it ends just anterior to it).

3. *Fibres rising in Bulbo-Pontine Reticular Cells.*—Scattered cells from the pyramidal decussation to above the posterior corpora quadrigemina give origin to fibres which descend in the anterior column of the spinal cord: they are the ventral reticulospinal fibres. For purposes of description the author divides these cell-groups into (1) Cajal's superior magno-cellular nucleus, (2) his inferior ditto. The P.L.B. in the rabbit receives the direct fibres of a cell-group which corresponds topographically with the superior magno-cellular nucleus described by Cajal for birds: this nucleus contains giant cells, but also (in rabbit) some small cells whose axons probably end in the brain-stem. The P.L.B. also receives fibres, both direct and crossed, from reticular cell-groups analogous with Cajal's inferior magno-cellular nucleus: the crossed fibres rise mostly in cells situated distally of the facial nerve: the direct fibres come from the proximal cells. (The P.L.B. does not, in the rabbit, receive any fibres from the nucleus of the raphe.) The longer descending fibres from the superior magno-cellular nucleus connect it with various levels of the neuraxis, and reach as far as the sacral cord: the shorter fibres, rising in its smaller cells, end in the brain-stem.

#### *B. Vestibular Fibres of the Posterior Longitudinal Bundle.*

1. *The Nucleus of the Descending Vestibular Root* sends both direct and crossed descending fibres into the P.L.B. To judge by Marchi's method, these fibres are not connected with the hypoglossal nerve (*contra* Keller, Probst, Edinger, Winkler, &c.); and

they do not go beyond the thoracic spinal cord (6 Th.); this agrees with Fraser, Russell. This nucleus also sends ascending fibres into the P.L.B., mainly crossed: most of these are intimately connected with the oculomotor and trochlearis nuclei: others terminate towards the distal end of the diencephalon in the neighbourhood of Meynert's bundle.

2. *The Triangular (Dorsal) Vestibular Nucleus*.—From its large cells come (a) descending fibres, chiefly direct, mainly from its ventral cells, which reach the P.L.B. *via* the internal arciform fibres, and (b) ascending fibres, mainly crossed: these rise in both the dorsal and the ventral parts of the nucleus. (The triangular nucleus also sends some fibres into the vestibulo-spinal tract.)

3. *The Nucleus of Deiters, Sensu Strictiori*.—By this term the author means the large cells of the internal segment of the inferior cerebellar peduncle: this nucleus sends a few descending fibres into the P.L.B., both direct and crossed (Kohnstamm denies crossed); it also gives origin, at any rate largely, to the direct vestibulo-spinal tract which does not enter the P.L.B.

4. *The Angular Nucleus of Bechterew* sends into the P.L.B. only ascending fibres, *apparently* mainly direct. (This reservation is explained on p. 299.) It also gives origin to van Gehuchten's Vestibulo-Mesencephalic bundle which occupies the lateral part of the P.L.B. (The author thus describes two ascending tracts of vestibular origin: (1) a compact, median, heterolateral one from the triangular and the descending vestibular nuclei, and (2) a scattered, lateral, homolateral one from Bechterew's nucleus, viz., the vestibulo-mesencephalic tract of van Gehuchten.) The author could not exclude the existence of some crossed fibres which may possibly come from Bechterew's nucleus, but he did prove that no descending fibres rise in it.

The following are some of the most important facts (many being quite new) established by the author: 1. The rabbit's P.L.B. shows a compact, dorso-median portion, and a scattered, lateral one: but anatomically these two portions have analogous connections. 2. The crossed ascending and descending fibres of the P.L.B. cross at the level of their cells of origin: there is no crossing of bundles in mass anywhere. 3. There are some direct fibres which cross the median line just before their termination, especially certain fibres of van Gehuchten's vestibulo-mesencephalic bundle: some of these fibres, arrived at the level of the third nucleus, cross to terminate in the opposite third nucleus (as van Gehuchten maintains). 4. There is no commissure in the P.L.B. 5. The posterior commissure—contrary to the opinion of many authors—is not formed by fibres which belong to the P.L.B. 6. Certain fibres of the posterior commissure rise in Kohnstamm's intra-commissural nucleus, but do not descend in the P.L.B. properly so-called; after

section of the posterior commissure a small fine bundle degenerates on each side, lateral and dorsal of the P.L.B. : its origin was not established: it is different from the tegmental bundle of v. Gudden. 7. Experiments by the combined chromolysis and direct Wallerian methods show that in the rabbit no fibres, rising in the 6th nucleus, pass by the P.L.B. into the root of the contralateral 3rd nerve (*contra* Duval and Laborde, and almost all writers except van Gehuchten). 8. The law of the excentric position of nerve-tracts applies to the greater part of the fibres of the P.L.B. 9. A very few commissural fibres pass from Bechterew's angular nucleus to the contralateral vestibular zone in rabbit and cat. 10. The superior cerebellar peduncles receive no fibres from Bechterew's nucleus. 11. The P.L.B. contains (*a*) no ascending fibres of spinal cord origin, (*b*) no primary vestibular fibres (*contra* Winkler, Cajal). All these statements refer to the rabbit.

Of the descending fibres of the P.L.B. (1) the mesencephalo-spinal reach the upper lumbar cord, (2) the metencephalo-spinal the sacral, (3) the fibres from the nucleus descendens vestibularis and the distal part of the nucleus triangularis vestibularis do not pass beyond the mid-thoracic cord. And, finally, all the ascending fibres of the P.L.B. are of vestibular origin. Unfortunately the author's figures have had to be kept back till the appearance of the next number of *Le Névraie*; they have been missed by the reviewer in places.

LEONARD J. KIDD.

**A GANGLION IN THE HUMAN TEMPORAL BONE NOT  
(260) HITHERTO DESCRIBED.** A. A. GRAY, *Proc. Roy. Soc. Lond.*,  
Vol. B. 86, No. B. 588, May 22, 1913, p. 323.

IN a macroscopic preparation of the sheep's middle ear Gray found a large nerve plexus on the posterior surface of the bulla, composed of bundles coming from the vagus and facial nerves. Microscopical sections of the human temporal bone revealed the plexus in the substance of the bone, close to the lowest point of the stapedius muscle: the plexus is much smaller than in the sheep, and its fibres are derived from the facial nerve and the auricular branch of the vagus. A comparatively large, irregularly shaped ganglion, associated with the plexus, was found embedded in the bone; it is situated immediately below the inferior termination of the stapedius muscle. It contains rather a large proportion of nerve fibres relative to the number of nerve cells: most of its cells are multipolar: a few bipolars are found in the upper portion. Its physiological rôle must be determined by experiment and clinico-pathological observation. Gray suggests that as the common disease otosclerosis presents diminution of cerumen, and

diminished sensitiveness of the tympanic membrane and the posterior wall of the external meatus (regions supplied by Arnold's nerve formed by the union of bundles from the vagus and facial), it is possible that autonomic fibres run from it to these regions. Five figures show the relations and structure of this ganglion for which Gray suggests the name "stapedial ganglion."

LEONARD J. KIDD.

#### **THE CARDIAC PLEXUS AND INNERVATION OF THE AORTA.**

(261) (*Recherches sur le plexus cardiaque et sur l'innervation de l'aorte.*) Y. MANOUÉLIAN, *Compt. Rend. de l'Acad. des Sci.*, Vol. 156, Sem. 1, No. 24, June 16, 1913, p. 1846.

A HISTOLOGICAL study by the silver nitrate method in dogs. The posterior cardiac plexus contains abundant nerve ganglia, mostly microscopic, whose cells are of sympathetic type; similar solitary nerve cells occur also in the interstitial tissue of the plexus, on its nerve filaments, and in the connective tissue of the middle coat of the proximal part of the aorta. (A) Nerve terminations in the elastic fibres and unstriated muscle: (1) The nerve fibres, of varying size and wavy outline, leave the connective tissue of the mesarterium and end in the elastic tissue either by a bud-shaped swelling or a tapering extremity; (2) the endings for the unstriated muscle cells are by arborisations analogous to the motor end-plates of striated muscle. (B) Nerve terminations in the connective tissue of the mesarterium: This tissue is richly innervated; the larger nerve fibres end in a large swelling of hatchet or club shape; the fibrils form a fine network. Other fibres end in large buds with small excrescences, and yet others in fine fibrils arranged like a ball of string. The author says the nerve fibres which end in the connective tissue must be sensory: he has not found sensory terminations in the mesarterium. The afferent fibres are of great importance in the mechanism of arterial dilatation and constriction: they subserve a reflex which begins in the sensory arborisation and ends in the motor nerve termination in the unstriated muscle. No figures are given.

LEONARD J. KIDD.

#### **PHYSIOLOGY.**

##### **OBSERVATIONS ON THE PREFERENTIAL USE OF THE RIGHT**

(262) **AND LEFT HANDS BY MONKEYS.** SHEPHERD IVORY FRANZ, *Journ. Animal Behaviour*, March-April, Vol. 3, No. 2, 1913, pp. 140-144.

It was found, from an examination of six monkeys, that one showed an apparent preference for the use of the right hand, and

two for the left; but more observations are needed before any definite preferential use of the hands in monkeys may be accepted as proven.

A. NINIAN BRUCE.

**THE NERVOUS MECHANISMS WHICH REGULATE CO-ORDINATION OF LOCOMOTOR MOVEMENTS IN DIPLOPODA.** (263) *(Sur les mécanismes nerveux qui règlent la co-ordination des mouvements locomoteurs chez les Diplopodes.)* A. CLEMENTI, *Arch. Ital. de Biol.*, Vol. lix., F. 1, May 10, 1913, p. 1.

**EXPERIMENTS on *Iulus*. Conclusions.**—1. Section of the nerve-cord does not abolish irreparably co-ordination of ambulatory movements of the legs between the metameres separated by the section. 2. Solar rays at temperature of 20° to 30° cause the reappearance of co-ordination of these movements apparently as perfect as those of the intact animal. 3. Backward movement of the legs—seldom seen in the normal animal—is possible in the segment deprived of all nervous connections with the œsophageal ganglion; but the auxiliary locomotor movements of the segments do not return. 4. Passive backward displacement of legs causes a wave of forward movement of the legs of the opposite side. 5. Decapitation does not abolish the rolling-up reflex; prolonged compression of the three first metameres evokes it, but it is not durable as in the normal animal. Extirpation of these metameres abolishes it. 6. The reaction to tactile and thermal stimuli changes its form with variation of the intensity of the stimulus.

The author interprets these findings to mean that diplopoda have an internal musculo-articular sensibility; that the œsophageal nerve-ganglion apparatus is the seat of the upper sensory, motor, and tonic centres; that the ventral nerve-chain of the three first metameres is the seat of the immediate centres of the rolling-up reflex; and that in the rest of the nerve-chain are distributed the segmental centres which regulate co-ordination by means of reflexes determined by the tactile and musculo-tendinous sensibility. The mode of walking of a normal *Iulus* is well figured and described.

LEONARD J. KIDD.

**THE FUNCTIONAL AUTONOMY OF THE SPINAL CORD: EXPERIMENTS ON THE AVIAN LUMBAR CORD.** (264) *(Contributions à l'étude des fonctions autonomes de la moelle épinière. Recherches expérimentelles sur la moelle lombaire des oiseaux.)* A. CLEMENTI, *Arch. Ital. de Biol.*, Vol. lix., F. 1, May 10, 1913, p. 16 (14 figs.).

SIX separate series of experiments were performed on ducks, Italian fowl, adult pigeons, and twenty-one newly hatched pigeons:

these last survived for from one to five days: in them station and locomotion develop only at the thirteenth to the fifteenth day. General conclusions: (1) The avian lumbar cord has a marked functional autonomy. (2) Independently of higher centres it cannot only permit of co-ordination of movements of the lower limbs but also evoke adequate equilibration reflexes during special alteration of the position of the bird's body. (3) The nervous mechanisms are reflex; those of reflex inhibition and antagonistic innervation play a notable part. (4) In general the musculo-articular superficies of the legs and rump represents the point of departure of the stimuli which can set in action the nervous mechanisms for locomotion of the limbs and for equilibration movements of the rump: stimuli of the force of gravitation and active experimental stimuli alike act thus. (5) The lumbar nerve-mechanisms of limb-locomotion are already active in the pigeon twenty-four hours after birth, when it cannot walk. (6) In the avian lumbar cord, like the canine, the functional autonomy of each separate segment has been lost: there is, however, a collective autonomy of many segments in the exercise of sensori-motor activities. The author suggests the name of "pluri-segmental" autonomy to distinguish it from the pure segmental autonomy of many invertebrates.

Specially interesting parts of this interesting study are (1) section four, which deals with alternate rhythmic swimming movements of the duck obtained in the isolated lumbar cord; and (2) section five, which deals with the existence of equilibration movements independently of the activity of the semicircular canals. The author upholds the teaching of Luciani—in whose laboratory these researches were carried out—that the semicircular canals are not the only equilibratory organs of the body.

LEONARD J. KIDD.

#### **REMARKS ON THE ORIGIN OF THE PHRENIC NERVE IN THE**

(285) **RABBIT, CAT, AND DOG.** ABBY H. TURNER, *Amer. Journ. Physiol.*, Vol. xxxii., No. 1, May 1913, p. 65.

SECTION and stimulation of the phrenic nerve often lead to doubt as to whether the whole or only part of the nerve is involved. Different individuals and the two sides of a single animal may vary in the number of phrenic roots and in their place of union. In the rabbit there are usually three roots, one each from the fourth, fifth, and sixth cervical nerves, but there may be two or four. In the cat the origin is from the fifth and sixth cervical nerves, only rarely from the fourth. In the dog the origin is from the fifth, sixth, and seventh cervical nerves. The place of final union of all

these branches varies, but is often among the great veins in the neck, and hence it is always advisable to divide or stimulate the phrenic nerve in the thorax rather than in the neck.

A. NINIAN BRUCE.

**DIRECT AND CROSSED RESPIRATION UPON STIMULATION (266) OF THE PHRENIC, THE SCIATIC, AND THE BRACHIAL NERVES.** W. T. PORTER and ABBY H. TURNER, *Amer. Journ. Physiol.*, Vol. xxxii., No. 2, June 2, 1913, p. 95.

IN the study of crossed respiration, the section and stimulation of the phrenic nerve within the chest and the direct inspection of the diaphragm are of great advantage. The accurate stimulation of the central end of the phrenic nerve in the rabbit does not cause contraction of the diaphragm or other reflex movements. In the cat reflex contractions of the diaphragm may follow the stimulation of the phrenic nerve. In the cat a strong stimulus is required to call forth a reflex with the phrenic nerve, while in the same individual a very weak stimulus to the sciatic or the brachial nerves will cause reflex contractions of the diaphragm. Hemisection of the spinal cord between the bulb and the phrenic nuclei stops the contractions of the diaphragm on the same side, but these contractions are at once resumed when the opposite phrenic nerve is severed by freezing. A mechanical stimulus, therefore, cannot be the cause of the crossed respiration.

A. NINIAN BRUCE.

**CARBON DIOXIDE PRODUCTION FROM NERVE FIBRES WHEN (267) RESTING AND WHEN STIMULATED; A CONTRIBUTION TO THE CHEMICAL BASIS OF IRRITABILITY.** SHIRO TASHIRO, *Amer. Journ. Physiol.*, Vol. xxxii., No. 2, June 2, 1913, p. 107.

ALL nerve-fibres give off carbon dioxide. When nerves are stimulated they give off more CO<sub>2</sub>. The CO<sub>2</sub> output of resting nerve is due to a vital active process. Anæsthetics greatly reduce the CO<sub>2</sub> output of nerves and dry seeds. Mechanical, thermal, and chemical stimulation also increases the CO<sub>2</sub> output of nerves. Single dry living seeds (oat, wheat, &c.) react in most particulars similar to nerves as regards their irritability, relation to anæsthetics, mechanical stimulation, and carbon dioxide outputs.

The general conclusion is drawn that irritability is directly dependent upon and connected with tissue respiration, and is primary a chemical process. These results strongly support the conception that conduction is of the nature of a propagated chemical change.

A. NINIAN BRUCE.



**THE CARDIO-VASCULAR ACTION OF PITUITARY POSTERIOR  
(268) LOBE EXTRACT IN ACUTE ADRENAL INSUFFICIENCY.**

H. CLAUD, and R. PORAK *Compt. Rend. Soc. de Biol.*, Vol. lxxiv.,  
No. 17, May 16, 1913, p. 1021.

THE authors showed recently that when purified and delipoided extracts of the posterior lobe of the pituitary of the ox were injected into man, rabbit, and dog, they produced, among other effects, a marked fall of arterial pressure. They here record experiments on eight rabbits in which acute adrenal suppression had been performed under chloroform anæsthesia, either by bilateral adrenalectomy or by forceps-compression of the hilum of each adrenal. On injecting intravenously posterior lobe pituitary extracts within from 5 minutes to 6 hours after the time of the bilateral adrenal suppression, a marked carotid hypertension was constantly produced, *i.e.*, the opposite effect of that obtained in the intact animal.

LEONARD J. KIDD.

**THE EFFECTS OF ADRENAL MASSAGE ON BLOOD-PRESSURE.**

(269) R. G. HOSKINS and C. M'PEEK, *Journ. Amer. Med. Assoc.*, Vol. 60,  
No. 23, June 7, 1913, p. 1777.

ADRENAL secretion has a depressor as well as a pressor action on vascular tension. Cannon and Lyman (1912) found that, in the cat, when blood-pressure is at a normal height, injection of pure epinephrin, in minute doses and at the proper rate, invariably produces a depression; this can be secured time after time; it varies, however, according to the existing degree of vascular tonus; if initial tension be low, only an augmented pressure can be secured. Hoskins and M'Clure also showed that, in the dog, fall of pressure follows minute doses; as these are increased the depressor is followed by a pressor effect. Stewart (1912) showed that massage of the adrenals causes an augmented adrenalin secretion. The authors find that in dogs of quiet temperament, gently handled, and etherised with as little excitement as possible, the exposed adrenals can be massaged; care was used to avoid traction on the mesentery or undue visceral irritation. The results obtained confirmed the observations of Hoskins and M'Clure on the effects of varying dosage of adrenalin; they ranged from marked depression with a small discharge to considerable rise when the glands were vigorously massaged, but the rise was never as great as that got by ordinary therapeutic dosage of adrenalin; tracings of the pressure are shown. Conclusions: (1) Adrenal secretion cannot be an immediate factor in normal blood-pressure; (2) a

small amount of normally circulating adrenalin has either no effect, or else a depressor effect, on arterial tension; (3) hypertension occurs only with an abnormal quantity of adrenalin; (4) the low blood-pressure of experimental hypoadrenalism or of Addison's disease is due, not to failure of a normal tonic stimulant to the sympathetic system, but probably to an interference with muscular metabolisms, including those of the heart and arteries.

LEONARD J. KIDD.

## **PATHOLOGY.**

**HISTOLOGICAL RESEARCH ON THE CENTRAL NERVOUS (270) SYSTEM IN A CASE OF CATATONIC DEMENTIA PRÆCOX.** (Ricerche istologiche sui centri nervosi in un caso di demenza precoce catatonica.) VINCENZO SCARPINI, *Rassegna di Studi Psichiat.*, Vol. II., F. 1, Gennaio-Febbraio 1912, p. 1.

THE author examined microscopically the brain of a case of catatonic dementia præcox, who had died from tubercular pleurisy. The changes in the cortex were mostly similar to those already described. In addition, however, he found marked cellular changes in the basal ganglia and cerebellum, both white and grey matter being affected, and he asks if perhaps some of these latter alterations may not be responsible for producing some of the clinical symptoms of the disease.

A. NINIAN BRUCE.

**PUNCTIFORM HÆMORRHAGIC PIGMENTATION OF THE CEREBRAL PIA MATER.** (271) E. M. WILLIAMS, *Jour. Nerv. and Ment. Dis.*, Vol. 40, No. 4, April 1913.

THE case of a man, 58 years, who had shown a stuporous mental condition and some weakness of the right side of his body. The brain macroscopically showed numerous minute brownish pigmented areas of pin-point size. A microscopical examination of these areas showed them to be lumps of granular pigment. They were mostly independent of the blood vessels, but some occurring around as well as within the vessel walls suggested the probability of their hæmatogenous origin.

The general appearance of the pia was that of a case of syphilis, as there was marked round and plasma cell infiltration.

D. K. HENDERSON.

## CLINICAL NEUROLOGY.

- BROWN-SÉQUARD SYNDROME WITH DISSOCIATION OF**  
 (272) **SENSORY LOSS OF THE SYRINGOMYELIC TYPE—**  
**PATHS OF SENSORY CONDUCTION IN THE SPINAL CORD.**  
 (Syndrome de Brown-Séguard avec dissociation syringomyélique  
 de la sensibilité (voies de la sensibilité dans la moelle épinière).)—  
 A. SOUQUES and R. MIGNOT, *Rev. Neurol.*, Ann. xxi, No. 8, April 30,  
 1913, p. 509.

THE clinical history and examination of a case of hæmatomyelia in which a Brown-Séguard syndrome was present below the 7th dorsal segment are given and serve as an introduction to a brief account of present views on sensory conduction in the cord.

P. W. SAUNDERS.

- THE RESPONSE OF THE LOWER LIMBS TO EXTERNAL**  
 (273) **STIMULI IN NORMAL INDIVIDUALS AND IN PATIENTS**  
**SUFFERING FROM SPASTIC PARAPLEGIA—NORMAL**  
**MOVEMENTS OF DEFENCE AND PATHOLOGICAL MOVE-**  
**MENTS OF DEFENCE.** (Sur les réactions des membres  
 inférieurs aux excitations extérieures chez l'homme normal et  
 chez le paraplégique spasmodique. Mouvements de défense  
 normaux, mouvements de défense pathologiques.) MARINESCO  
 and NOICA, *Rev. Neurol.*, Ann. xxi, No. 8, April 30, 1913, p. 516.

THE authors compressed one lower limb by an Esmarch's bandage after the methods adopted by Babinski, and then stimulated the sole of the anæmic limb as in testing for Babinski's plantar reflex.

In the anæmic limb of the normal individual they found an abolition of the Achilles jerk, and an exaggeration of the defensive movements of the toes, foot, leg, or limb as a whole. In individuals whose spastic paraplegia was so advanced that all or almost all voluntary movement of the legs was lost, the Babinski plantar reflex disappeared when the anæmic limb was tested and movements of defence diminished in intensity. In those individuals who still had considerable motor power in their legs and considerable sensation present, the anæmic limb showed loss of Babinski reflex, but movements of defence not only persisted, but might be exaggerated as in the normal person.

In correlating their results, the authors make use of the physiological conception that movements of defence exist under two categories. Firstly, there are the normal conscious movements which can be inhibited by the will up to a certain extent, that is, until the painful stimulus that tends to provoke them becomes unbearable. Such are the quick nervous movements of

resistance or withdrawal that the limb of the normal individual shows when the skin of the sole is painfully stimulated, and which were more energetic and even made bilateral when the normal limb was rendered anæmic or asphyxiated before being tested. Secondly, there are the involuntary movements not accompanied by any conscious sensation, let alone painful impression, movements over which the will has no control. To this class belong the Babinski reflex, and the slow, sluggish movements of flexion and withdrawal that may accompany it in paraplegic cases, movements that became diminished or absent in the anæmic paraplegic limbs and began to increase or appear again in the first few minutes after the ligature was removed. P. W. SAUNDERS.

**LAMINECTOMY IN COMPRESSION PARAPLEGIA.** (La laminectomie dans la compression médullaire: treize interventions chez onze malades. Un cas de guérison complète.) A. VAN GEHUCHTEN and A. LAMBOTTE, *Le Névralgiste*, Vol. 13, F. 2, 3, April 1, 1913, p. 311.

THE case of recovery after laminectomy for compression paraplegia by a spinal cord tumour seems to be the first successful one yet recorded in Belgium. It was one of intradural tumour, in a man of 47, operated on early; an interesting feature was that Wassermann in the blood was positive, but lumbar puncture gave a clear fluid, with negative Wassermann and no lymphocytosis. Two fatal cases are recorded: one showed by Marchi no ascending or descending degeneration in the spinal cord. Three times diagnosis was erroneous: in the first case, a man of 50, operated on for symptoms of medullary compression, nothing was found, and patient survived. The second and third were cases of the paraplegic type of disseminated sclerosis: one, a nun of 31, died four months after operation; the other, a woman of 52, died six months after operation; this case is noteworthy because the first symptoms began as late as 51 years of age. In both these cases of microscopically typical disseminated sclerosis there was a definite level on the trunk of objective anæsthesia: the younger woman showed a definite level of loss of sensibility to pain below the third rib in front, and the fifth thoracic spine behind; the older woman had total loss of superficial and deep sensibility below fifth rib in front, and ninth thoracic spine behind. It was noted also in these two cases at the operation that there was absence of cerebro-spinal fluid on incision of the dura. Case eleven is held to be the most instructive: it showed the necessity for early operation. The authors maintain that the vertebral laminae are of little importance for the stability of the vertebral column: in their case eleven, nine

laminæ were resected; in one case operated on by Desguin ten laminæ. They also believe that the alleged evil effects of loss of cerebro-spinal fluid have been greatly exaggerated. The future of surgical neurology depends, they hold, on improvement in diagnosis and earlier operative intervention. The paper has six figures.

LEONARD J. KIDD.

**ATROPHY OF DISTAL MUSCLES IN ALL FOUR EXTREMITIES.**

(275) ?CAUSE. F. E. BATTEN, *Proc. Roy. Soc. Med.*, Vol. vi., No. 2, Dec. 1912 (Neurol. Sect.), p. 43.

THE patient was a woman, aged 33. She had had three pregnancies. The first resulted in a miscarriage, the second and third in healthy children. After the second she had weakness of the extremities for three months, from which she completely recovered. The legs again became weak after the third confinement, and a few months later her hands also became affected. The muscles began to waste, she lost sensation, and became unable to walk. All the deep reflexes were abolished, and the plantar and abdominal reflexes were lost. The electrical reactions show a diminution of response in all the peripheral muscles. The proximal react normally. The Wassermann reaction is negative.

The case was discussed at the meeting; the general trend of opinion lay in the direction of peripheral neuritis.

A. NINIAN BRUCE.

**CASE OF ORGANIC HEMIPLEGIA FOLLOWING TYPHOID FEVER, IN WHICH THE PLANTAR REFLEX IS FLEXOR, BUT BABINSKI'S "SECOND SIGN"—COMBINED MOVEMENT OF THE TRUNK AND PELVIS—IS PRESENT.** A. F. HERTZ, *Proc. Roy. Soc. Med.*, Vol. vi., No. 3, Jan. 1913 (Clin. Sect.), p. 63.

THE patient was a man, aged 31, who at the end of the second week of typhoid woke one morning to find that the left side of his face and his left arm and left leg were paralysed. The paralysis diminished for a time, but after some months no further improvement occurred. The evidence was in favour of an organic hemiplegia, due probably to cerebral softening following thrombosis occurring during typhoid fever. The left plantar reflex, however, was flexor. Babinski's "second sign" was present. The patient, lying flat on his back, with his arms folded across his chest and his legs widely separated, is told to rise to the sitting position without using his arms. At each attempt to do so the paralysed leg rises, the other leg remaining on the floor or rising considerably

less high. In hysterical hemiplegia the paralysed leg remains flat on the floor. This sign is often of great value.

A. NINIAN BRUCE.

**ACUTE POSTERIOR GANGLIONITIS, SIMULATING SURGICAL**  
(277) **CONDITIONS IN THE ABDOMEN.** L. LITCHFIELD, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 22, May 31, 1913, p. 1691.

HERPES zoster is the eruption, the peripheral manifestation, of acute posterior ganglionitis. The prodromal period may extend over several days, and be attended by such sharp and severe pain as to simulate appendicitis, renal colic, gall-stones, &c., and lead to surgical interference. Two cases are recorded, one with sharp pain over the left ureter, and the other with severe pain over the upper part of the abdomen. In both cases the eruption appeared before operation had been attempted.

A. NINIAN BRUCE.

**SPONTANEOUS HÆMATOMATA IN A TABETIC WOMAN.** (Sur  
(278) **un cas de hématomés spontanées chez une tabétique.**) J. FISCHER,  
*Thèses de Paris*, 1912-13, No. 208.

THE thesis contains the histories of nine cases, including the following unique personal one: A woman, aged 44, who had suffered from tabes for ten years, after attacks of lightning pains, showed a diffuse œdema of the thigh extending from the knee to the buttock. As the œdema subsided the hæmatomata appeared, and gradually absorption took place. The phenomenon is attributed partly to syphilitic vascular lesions and partly to vaso-motor disturbances.

J. D. ROLLESTON.

**REPORT OF A CASE OF PNEUMOCOCCUS MENINGITIS WITH**  
(279) **NORMAL CEREBRO-SPINAL FLUID.** JULES M. BRADY,  
*Journ. Amer. Med. Assoc.*, Vol. lx., No. 13, March 29, 1913, p. 973.

THE patient was a boy, aged 1 year, who suffered from an attack of broncho-pneumonia with exudative pleurisy. As he also showed a number of nervous symptoms suggesting pneumococcus meningitis a lumbar puncture was performed, but the cerebro-spinal fluid was clear, and contained no organisms. After death, however, a thick fibrino-purulent exudate was found over the frontal and parietal lobes. The base was not involved.

A. NINIAN BRUCE.

**ENCEPHALO-MENINGITIS DUE TO PFEIFFER'S COCCO-BACILLUS.** (*Encéphalo-méningite à cocco-bacille de Pfeiffer.*)

G. ROSENTHAL, *Journ. de méd. de Paris*, 1913, xxxiii., p. 244.

A FATAL case in a youth of 18. There was sudden onset with headache, fever, and vomiting. The patient rapidly got worse, and coma set in on the sixth day. Lumbar puncture gave issue to an almost clear fluid without hypertension, containing a small number of polynuclears and yielding Pfeiffer's organisms in cultures. Death took place next day. No necropsy.

J. D. ROLLESTON.

**A CASE OF MENINGITIS DUE TO SERUM.** (*Un cas de méningite sérique.*) E. JOB and L. LÉVY, *Paris méd.*, 1912-13, i., p. 582.

A MAN, aged 32, was admitted to hospital with meningococcal meningitis, which was treated with Dopter's serum. After four days' apyrexia the temperature rose again. Although the cerebro-spinal fluid was perfectly clear, a fresh injection of serum was given, and within three hours severe headache, general hyperæsthesia, and pains in the lower limbs ensued. Lumbar puncture performed six hours after the injection gave issue to a puriform fluid under hypertension, and was followed by immediate relief of the symptoms, which completely disappeared within forty-eight hours. The puriform fluid was sterile, and contained perfectly normal polymorphonuclears and a few red cells (*cf. Review*, 1910, viii., p. 702, and 1911, ix., p. 575).

J. D. ROLLESTON.

**A POSSIBLE SOURCE OF DANGER IN THE USE OF ANTI-MENINGITIS SERUM.** S. P. KRAMER, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 18, May 3, 1913, p. 1348.

THE author describes the case of a child who received an intraspinal injection of antimeningitis serum for cerebro-spinal meningitis. Two minutes later she stopped breathing and became livid, the pupils being contracted and the heart beating strongly. After three minutes of artificial respiration she again breathed normally, and showed an internal strabismus of the right eye. An hour later a left hemiplegia developed, which partially passed off. She died a week later from pneumonia.

Three other somewhat similar cases are recorded, and the author considers that the great similarity of these cases of respiratory paralysis to that following the lumbar injection of cocain points to their being toxic in origin.

He suggests that if the needle should injure the filum and

make an artificial opening into the central canal, a direct channel is opened which might deliver a toxic material injected into the subdural space to the fourth ventricle. Serum containing 0.5 per cent. tricoresol cannot safely be injected into the subarachnoid space.

A. NINIAN BRUCE.

**SEROUS OTITIC MENINGITIS, WITH SEPTIC THROMBOSIS OF  
(283) THE LEFT LATERAL SINUS AND INTERNAL JUGULAR  
VEIN, SUCCESSFULLY TREATED BY OPERATION. E.  
MALCOLM STOCKDALE, *Journal of Laryngol., Rhinol., and Otol.*,  
Vol. xxviii., No. 1, Jan. 1913.**

A CASE of chronic otitis media, with extensive thrombosis of sinus and internal jugular vein. Staphylococci were found in the cerebro-spinal fluid at operation and subsequently. Six days later, as the temperature was rising and patient worse, the subarachnoid space was opened for drainage above and below the sinus. This was followed by improvement, but a cerebellar hernia developed, and in two months' time reached the size of a hen's egg. Rotatory spontaneous nystagmus was present on looking to the right and left, inco-ordination of arm movements, slight Rombergism falling to the side of the lesion; occasional vomiting also present. The hernia burst and the patient was collapsed. The same evening the hernia was very slowly removed, a ligature being tightened round it. The operation was completed next day as the patient was very collapsed. The portion of cerebellum consisted of medulla and cortex. Recovery was complete, there being no obvious defect due to the loss of cerebellar tissue.

R. VÉREL.

**ATHETOSIS OF LEFT HAND WITH TREMOR OF RIGHT  
(284) HAND. E. G. FEARNSIDES, *Proc. Roy. Soc. Med.*, Vol. vi., No. 4,  
Feb. 1913 (Neurol. Sect.), p. 81.**

THE patient was a man, aged 67. Nineteen years ago he was walking along the road when he suddenly turned giddy and almost fainted. He then walked home and was put to bed, and during the next few hours his left face became twisted, and later the left half of his body and his left arm and left leg became weak, numb, and cold. He was off work for three months, and gradually improved, although the numbness and coldness persisted. In August 1911 he came under observation for "indigestion," and was found to have athetosis of the left hand, weakness and numbness of the left half of the body, and a tremor of his right hand. History of alcoholic excess, had no syphilis. Wassermann negative.



The above association is rare, and at the discussion it was suggested by Dr S. A. K. Wilson that these symptoms might be produced by a lesion on the right side in the extreme upper part of the pons just below the red nucleus. Such a lesion, involving Manakow's bundle after it had crossed, would cause tremor of the right limbs. Probably the lesion also involved the fillet, and if it were to include the superior cerebellar peduncle after it had crossed it would produce such an effect on the opposite cortex as to allow of athetosis of the left side.

A. NINIAN BRUCE.

**A CASE OF PERIODIC PARALYSIS.** H. WILLOUGHBY GARDNER, (285) *Brain*, Vol. xxxv., Part iii., 1913, p. 243.

THE patient was first seen in the spring of 1907. For two years he had been subject to attacks of complete paralysis of his arms and legs, which attacks were getting more frequent and more severe, and threatened to incapacitate him completely. The first attack occurred in August 1905 when he was fifteen years of age. The second nine months later, and the third, fourth, fifth, sixth, and seventh attacks at diminishing intervals of six months, three months, two months, one month, and two weeks respectively, and the interval between the eighth and ninth attacks was only ten days. The attacks were becoming not only more frequent, but also more severe and longer in duration. The sixth and eighth attacks each lasted three whole days. Between the attacks the patient was apparently in perfect health. For as long as he could remember before their commencement he had been subject to "sick headaches"; these ceased when the attacks of paralysis commenced.

No similar attacks had ever occurred in any member of his family; he was not in any way neurotic, nor was there any neurotic family history.

The attacks always began in the early hours of the morning. The patient would wake up with a headache, aching all over, and would find himself unable to move his arms, legs, or head, though his legs were always more completely paralysed than his arms. The intercostal muscles were in some attacks greatly affected, so that his respiration was entirely diaphragmatic; but in other attacks little or not at all.

The knee jerks and ankle jerks were completely absent, and so were the deep reflexes in the upper limbs, and there was no ideomuscular contractibility in the affected muscles. The skin reflexes were present, but greatly diminished. The paralysed muscle did not contract at all in response to the faradic current. In several attacks the patient was unable to pass water, and the use of a

catheter was necessary. The bowels also never acted during an attack. There was no loss of sensation to touch, pain, or heat and cold. The pulse was 42, and there was well-marked cardiac dilatation, the apex being half-an-inch outside the nipple line, and a soft systolic murmur being present.

After the paralysis had lasted for one, two, or three days the patient would awake nearly well, and would rapidly recover completely, and be able to walk five miles home, and even to return to work. His motor power would then be perfect, his knee jerks and other deep reflexes brisk, his skin reflexes and electrical reactions very active; all headache and aching of the limbs would have disappeared, and the cardiac dilatation would be rapidly subsiding.

It was noticed that the attacks, or at least the warnings thereof, nearly always began on a Sunday. The exciting cause seemed to be violent exertion, such as a football match on the Saturday half holiday, especially if followed by a heavy supper.

The writer came to the conclusion that the attacks were due to auto-intoxication, the presence of the special toxins being due to some congenital defect in metabolism. His reasons were:—

1. The many points of resemblance to other conditions undoubtedly due to auto-intoxication, many of which show a similar "periodicity" in their manifestations.

2. The sudden onset and the rapid recovery.

3. The invariable recurrence of the phenomena during the night after some hours of sleep, when waste and toxic products may be assumed to have accumulated, and when intestinal digestion is taking place.

4. The fact that the condition could at its commencement occasionally be shaken off if the patient was able to get up and walk about.

5. The symmetrical distribution of the paralysis.

6. The occurrence of headache, drowsiness, thirst, anorexia, aching of the limbs and sweating during the attacks—symptoms practically common to many toxæmic conditions.

7. The high specific gravity of the urine passed during the attacks, and the presence in it of small quantities of indican.

8. The fact that in some attacks severe bilious vomiting coming on after some time seemed to cause rapid disappearance of the symptoms, and that in one instance a prompt attack of such severe vomiting apparently prevented the development of paralysis.

9. The fact that the attacks of paralysis apparently took the place of previous attacks of "bilious headache."

Believing this, the writer hoped that treatment adapted to meet or to prevent such auto-intoxication would prove useful.

The treatment prescribed was to take no beer or rich food of any kind; to drink large quantities of water; mag. sulph. O.P.M.

calomel gr. ii. once a fortnight, and whenever an attack seemed to be threatened, caffein gr. vii. ss. with pot. brom. and acid hydrobrom. dil. whenever any warning symptoms occurred.

The success of the treatment was immediate. The attacks ceased for two years. Then one occurred after a hard game of football. The patient was told to take the calomel, and a dose of the caffein mixture, to eat only a light supper, and drink much water after a football match. As long as he followed instructions no attacks occurred, and he was able to play football with impunity. After a time he discontinued treatment; the attacks recurred, but have ceased since the patient once again obeyed instructions.

The case is noteworthy for its extreme rarity, and for the fact that though usually a family disease, no other members of the family have so far been affected; also for the success of the treatment adopted.

AUTHOR'S ABSTRACT.

**REPORT OF A CASE OF BRAIN TUMOUR.** E. E. MORRISON, *Journ. (286) Amer. Med. Assoc.*, Vol. ix., No. 17, April 26, 1913, p. 1280.

CASE of a woman, aged 59, who suffered progressively from drowsiness, headache (mostly occipital), vomiting, defective vision, vertigo, hebetude, delusions, hallucinations, paresthesia, paralysis of left lower limb, and ataxia in the right lower limb, and disorientation. Optic neuritis was present. No operation. At the autopsy a partially encapsulated, round, dark-coloured tumour about the size of a walnut was found in the right hemisphere of the cerebellum behind the wall of the fourth ventricle, and pressing on the pons. On section the tumour was considered to be a gliosarcoma.

A. NINIAN BRUCE.

**TUMOURS OF THE CEREBELLO-PONTINE ANGLE.** A. W. LUCKE, (287) *Cleveland Med. Journ.*, Vol. xii., No. 5, May 1913, p. 325.

A CASE is here described of a man, aged 54. He had always been healthy until eight years ago, when he had typhoid fever, and about this time began to notice he had difficulty in hearing with the right ear and tinnitus. Later he became completely deaf, and developed a walk like a drunken man. His eyesight then failed, and mental condition became impaired, and severe headaches developed. A cerebello-pontine angle tumour of the right side was diagnosed, and he was trephined over both posterior fossæ. Five days later the dura was incised, and a tumour, later found to be a fibroma, was removed from the right antero-lateral wall of the cerebellum. The patient was discharged from hospital three weeks later, and returned to work.

There is a short account of the symptoms of such tumours appended.  
A. NINIAN BRUCE.

**A CASE OF CHOLESTEATOMA OF THE BRAIN.** I. STRAUSS, *Jour.* (288) *Nerv. and Ment. Dis.*, Vol. 40, No. 4, p. 257.

THE case of a woman, 34 years, who presented somewhat anomalous clinical symptoms. At the autopsy an encapsulated tumour was found which microscopically proved to be a cholesteatoma, possibly of embryonal origin.  
D. K. HENDERSON.

**A CASE OF HYPOPHYSIS TUMOUR OPERATED ON BY**  
(289) **HIRSCH'S METHOD.** (Über einen Fall von Hypophysen-tumor, erfolgreich nach Hirsch operiert.) G. HOLMGREN, *Ztschr. f. Ohrenheilk.*, B. lxvi., H. 1 and 2, 1912, S. 39.

PATIENT has had symptoms for two years, and increasing affection of his sight. Admitted. In the right eye only light perception, with the left could count fingers immediately in front of the eye. X-ray showed: anterior boundary of the sella turcica much less sharp than normal, posterior absent. Decompression determined on. Operation by Hirsch's method. The roof and posterior walls of the sphenoid sinus were found soft, red, and bulging into the sinus. Orientation was difficult. The dura was opened, and some tumour masses removed with the spoon.

After becoming worse for a few days the sight steadily improved, and is now  $\frac{2}{10}$ .  
R. VÉREL.

**CASE OF CYST OF THE PITUITARY FOSSA; OPERATION BY**  
(290) **THE NASAL ROUTE.** C. I. GRAHAM, *Proc. Roy. Soc. Med.*, Vol. vi., No. 3, Feb. 1913 (Laryngol. Sect.), p. 61.

THE patient was a woman, aged 37, who was admitted to hospital for failing sight for eighteen months, temporal headaches, drowsiness, slow mental reaction, and incontinence. The drowsiness increased to coma and the respiration slowed to nine or ten per minute. Optic atrophy in right eye, vision present in nasal field of left eye.

Operation was undertaken by the nasal route. On opening into the pituitary fossa 1 to 2 dr. of blood-stained fluid rushed out. The wound was closed. The respiration became twenty-four. During the first twenty-four hours after the operation there was great thirst, frequency of micturition and polyuria. She became practically normal except for the eyesight, which only improved slightly. The patient left hospital twenty days after the operation.  
A. NINIAN BRUCE.

**ON THE PHYSIOPATHOLOGICAL RELATIONS BETWEEN THE  
(291) HYPOPHYSIS SYSTEM AND VARIOUS CHRONIC DISEASES  
OF THE NASOPHARYNX AND SPHENOIDAL SINUS.**

(Ueber die physio-pathologischen Beziehungen zwischen dem Hypophysensystem und verschiedenen chronischen Erkrankungen des Nasenrachens und der Keilbeinhöhlen.) R. VÉREL and Prof. CITELLI, *Ztschr. f. Laryngol. Rhinol. u. Grenzgeb.*, Bd. v., H. 3, Juli 26, 1912, S. 513.

THE author examined histologically five hypophyses from adenoid patients. The ages varied from 6 months to 26 years. They all showed signs which are usually recognised as those of hypersecretion and hyperplasia. In control cases of similar ages these signs were absent. Three cases are quoted next in whom adenoids were present. All complained of being easily tired, inability to concentrate or remember, physical torpor, and tendency to fall asleep. Two of these cases were treated with Wellcome's pituitary extract, and recovered completely; the adenoids were then removed. In the third the adenoids were removed first, but no improvement took place until pituitary extract was given. The amnesia cleared up last. A case of soft fibroma of the roof of the nasopharynx showed similar symptoms, and was cured by removal of the growth. Similar symptoms may be found in disease of the sphenoidal sinus

A. VÉREL.

**THE PRESENT KNOWLEDGE OF THE STATUS OF APRAXIA.**

(292) ALFRED GLASCOCK, *Journ. Nerv. and Ment. Dis.*, Vol. 40, Nos. 3 and 4, March and April 1913.

A BRIEF historical sketch is given of the origin of the term apraxia, and credit is given to Liepmann and the German School for the clear way their views have been expressed on the subject. The present status of agnosia is also briefly considered.

The term apraxia is employed where there is a disturbance on the motor side of the sensori-motor arc. It means that the individual fails to carry out some subjective purposive movement, or movement complex, notwithstanding his appreciation of what is required of him, and the absence of sensory disturbances, motor or co-ordination defect.

The classification advocated by Liepmann is given in detail.

In discussing the localisation of apraxia, it is said to be due either to a cortical or sub-cortical lesion, is always supra-capsular in origin, and a sign which proves this, according to Liepmann, is the presence of aphasia. Summary statements are given of the views of Heilbronner, von Monakow, and others, and the cases of Liepmann, Hartmann, Kleist, and others are discussed.

The case of a man, 64 years, suffering from arterio-sclerotic brain disease is fully reported.

He presented a motor aphasia, marked dysarthria, and some paraphasia. His understanding of spoken language was unimpaired. To what extent alexia, if present, existed, it was difficult to ascertain owing to impaired vision. There was almost complete tactile agnosia in both hands. In spite of the absence of paralysis there was a bilateral inability to perform certain motions or motion complexes, notwithstanding in each test complete understanding by the patient of what was required of him.

D. K. HENDERSON.

**A CASE OF HYPOGLOSSAL NUCLEI PARALYSIS.** A. M. MOLL, (293) *Jour. Nerv. and Ment. Dis.*, Vol. 40, No. 3, March 1913.

A MAN, aged 30, with a specific history had, a few days previous to his entering the hospital, some difficulty in speech. Following this he experienced difficulty in swallowing, in mastication, and in walking, but at no time was there any loss of consciousness. A month later difficulty in eating and speaking developed, he was unable to whistle, saliva dropped from the mouth, and the tongue was found to be flaccid, atrophied, showed fibrillar tremors, and could not be protruded. The faradic responses of the tongue were much diminished. The point of chief interest in the case was that the orbicularis oris clearly participated in the electrical reactions.

The patient has shown considerable improvement by means of treatment with mercury and the iodides. D. K. HENDERSON.

**CASE OF SEVENTH AND EIGHTH NERVE PARALYSIS AFTER (294) NEO-SALVARSAN INJECTION.** A. M. H. GRAY, *Proc. Roy. Soc. Med.*, Vol. vi., No. 3, Jan. 1913 (Dermatol. Sect.), p. 79.

THE patient was a man, aged 22, who showed a typical syphilitic eruption all over. He was given 0.9 gr. of neo salvarsan. The symptoms all cleared up. Six weeks later he became deaf on the left side, and noticed the left side of his face did not move. The author considered that the treatment had been insufficient, and that a localised lesion had developed in his internal auditory meatus, probably syphilitic in nature. The case was discussed at the meeting, especially as to whether the paralysis was the result of the disease or of the remedy. A. NINIAN BRUCE.

**AN EYE LESION FOLLOWING TWO INTRAVENOUS INJECTIONS (295) OF SALVARSAN, BUT RELIEVED BY ITS FURTHER USE.**

HAROLD J. LEVIS, *Journ. Amer. Med. Assoc.*, Vol. ix., No. 18, May 3, 1913.

THE patient was a man, aged 22, with three primary lesions. He was given 0.6 gm. salvarsan intravenously, repeated twenty-

three days later. A few weeks later he developed a congestion of the bulbar conjunctiva and photophobia, followed by diminution of vision, which grew rapidly worse. A marked and steady improvement followed a third injection.

It is pointed out that this case also shows that salvarsan is not contra-indicated in active syphilitic eye disease.

A. NINIAN BRUCE.

**THE TREATMENT OF SYPHILIS WITH SALVARSAN: FIRST (296) 1,000 CASES TREATED AT THE ROYAL NAVAL HOSPITAL AT PLYMOUTH.** L. KILROY, *Lancet*, Feb. 1, 1913, p. 302.

Two thousand one hundred and forty-seven injections were given to 1,000 cases with 13 invalidings, no deaths, and 22 clinical relapses re-admitted to this hospital, 2 admitted to other naval hospitals, and 2 occurring in ships. No salvarsan was given to cases of (1) heart disease, (2) albuminuria, (3) diabetes, (4) advanced tabes, (5) general paralysis of the insane; 17 cases received one injection each here with no clinical relapses; 901 received two injections here, of which 25 relapsed; 68 received three injections, with 1 relapse; and 14 received four injections, with no relapses.

A. NINIAN BRUCE.

**OILY INJECTIONS OF SALVARSAN—A WARNING.** H. H. (297) HAZEN, *Journ. Amer. Med. Assoc.*, Vol. ix., No. 21, May 24, 1913, p. 1618.

OILY injections give excellent results as far as the effect on the lesions and Wassermann reaction, and as far as pain and disability are concerned, but they are apt to be followed by sterile abscesses at the site of injection in from three to twenty-four months later, apparently the material injected being toxic to the tissue at the site of injection, and the dead tissue, if not absorbed, gives rise to the abscess.

A. NINIAN BRUCE.

**A CASE OF PUERPERAL TETANUS.** (Un cas de tétanos puerpéral.) (298) PIERRET and H. LEROY, *L'Echo méd. du Nord*, 1913, xvii, p. 131.

A WOMAN, aged 35, had a miscarriage at two months which was followed by persistent hæmorrhage requiring repeated vaginal injections. Seven days after the miscarriage symptoms of tetanus developed, and death took place within twenty-two hours. The cerebro-spinal fluid was normal, and no visceral lesions were found post mortem.

Cases of puerperal tetanus are very rare, and form only 3 per cent. of all cases of tetanus.

J. D. ROLLESTON

**TETANUS; CHLORETONE POISONING; RECOVERY; FOLLOWED**  
 (299) **BY POLYNEURITIS.** E. G. FEARNSIDES, *Proc. Roy. Soc. Med.*,  
 Vol. vi., No. 2, Dec. 1912 (Neurol. Sect.), p. 54.

THE patient was a boy, aged 13, who ran a piece of old iron into his perineum while playing on some planks. At the time no abrasion of the skin could be found. Five days later stiffness of the right leg set in. Three days later a large perineal abscess developed, requiring evacuation under an anæsthetic. Four days later the stiffness and pain increased and spread to his left leg and jaw. On any movement he fell into general tonic spasms, and his face showed a risus sardonicus. He was given 20 c.c. twice a day of antitetanic serum, with 120 gr. pot. brom. and 60 gr. chloral hydrate. As their effect was very slight, 30 gr. of chloretone was given four-hourly. This controlled the spasms, but produced coma and broncho-pneumonia, and he was considered to be moribund. He is, however, gradually recovering, though there is much general muscular weakness and wasting.

The case was discussed at the meeting, special attention being given to the cause of the polyneuritis as the result of the (a) abscess; (b) chloretone; (c) serum; (d) tetanus. A. NINIAN BRUCE.

**CASE OF RAYNAUD'S DISEASE.** H. C. SEMON, *Proc. Roy. Soc. Med.*, Vol. vi., No. 3, Jan. 1913 (Dermatol. Sect.), p. 82.

THE patient, a woman, aged 56, came with a seven years' history of recurrent local asphyxia of fingers, toes, and nose. The tips of the fingers of the right hand had become gangrenous for the last few months. Wassermann's reaction was positive, but she had had no miscarriages, and no other symptoms pointing to syphilis.

At the discussion various opinions were put forward in regard to the relation of syphilis to Raynaud's disease.

A. NINIAN BRUCE.

**ON THE FUNCTIONAL ASSOCIATION OF THE THYROID AND**  
 (301) **OVARY** (Au sujet de l'association fonctionnelle entre la glande thyroïde et l'ovaire.) G. BATTEZ, *L'Echo méd. du Nord*, 1913, xvii., p. 210.

THE patient was a woman, aged 46. At 44 she had a miscarriage at seven months, and subsequently menstruation became scanty, and then ceased suddenly. Symptoms of Graves' disease then began. Ovarian opotherapy was started in March 1912, and continued in June, August, and October. There was an immediate slowing of the pulse, and in January 1913 menstruation reappeared, and became normal the following months. Although she had had



no treatment since October 1912, her general condition in April 1913 was good, the appetite was normal, insomnia had ceased, and there was a marked diminution of the tremors and exophthalmos.

J. D. ROLLESTON.

**PELLAGRA: SOME FACTS IN ITS EPIDEMIOLOGY.** R. M. (302) GRIMM, *Journ. Amer. Med. Assoc.*, Vol. ix., No. 19, May 10, 1913, p. 1423.

MORE cases develop among the whites than among the negroes. More cases occur among females of both races than among the males. More cases develop at ages between twenty and forty years than at other ages. Among the married and widowed pellagrins the females predominate; the single pellagrins are equally divided between the sexes. More cases had their onset during the months of May and June than in other months, and more in 1911 than in any previous year. More cases develop under conditions of poverty than of comfort, and more under conditions of comfort than of affluence. More cases develop in the vicinity of other cases than otherwise. None of the facts seem to indicate that pellagra is hereditary. The food used by the people in whom pellagra is prevalent deserves consideration as a possible etiologic factor.

A. NINIAN BRUCE.

**TUBERCULOUS NEURITIS.** (*Neurites tuberculosas.*) F. ESPOSEL, (303) *Arch. Bras. de Med.*, 1913, iii., p. 129.

ESPOSEL comes to the following conclusions: Tuberculosis is a frequent cause of neuritis. In many patients it may be regarded as the only cause, in others it may act in conjunction with other factors, viz., auto-intoxication, especially by alcohol or arsenic. Many useful signs for the early recognition of tuberculosis are due to neuritis or neuromyositis. Generalised polyneuritis is not frequent. 95 per cent. of the tuberculous patients examined by Esposel showed some form of disturbance of sensibility. The tendon reflexes in the lower limbs were diminished in 37 per cent., normal in 32 per cent., absent in 18 per cent., and increased in 13 per cent.

All showed diminished excitability to galvanic and faradic currents in examination of the lower limbs.

J. D. ROLLESTON.

**A NEW METHOD OF TREATING NEURALGIA OF THE TRIGEMINUS BY THE INJECTION OF ALCOHOL INTO THE GASSERIAN GANGLION.** JULIUS GRINKER, *Journ. Amer. Med. Assoc.*, Vol. lx., No. 18, May 3, 1913, p. 1354.

THE method described here is that recommended by Dr Härtel of Bier's clinic, and is as follows: The needle is introduced through the cheek opposite the alveolar process of the second upper molar tooth. The patient then approximates his teeth, and the operator puts the index finger of his left hand into the mouth and guides the needle between the border of the inferior maxilla and the tuberosity of the superior maxilla. The needle is then pushed into the zygomatic fossa on to the broad under surface of the great wing of the sphenoid, from which it is pushed into the foramen ovale at a depth of about 6 cm. from the point of entrance. Violent pain is at once felt in the distribution of the inframaxillary nerve and the needle is pushed on until pain is also experienced in the second branch of the trigeminus within the ganglion. From 0.5 c.c. to 1 c.c. of 80 per cent. alcohol is then injected.

The most important objection to this method is the risk of neuroparalytic keratitis, and thus it is a method only to be used in the worst cases after peripheral nerve injections have proved unsuccessful.

A. NINIAN BRUCE.

## PSYCHIATRY.

**THE OCCURRENCE OF THE SYPHILITIC ORGANISM IN THE BRAIN IN PARESIS.** J. H. MOORE, *Jour. Nerv. and Ment. Dis.*, Vol. 40, No. 3, March 1913.

A SOMEWHAT fuller account is given in this article than in that by Noguchi and Moore in the *Jour. of Exp. Med.*, Feb. 1, 1913 (*v. Review*, 1913, xi., p. 174) in regard to the discovery of the *Treponema pallida* in twelve out of seventy cases of general paralysis. Most of the sections were from the frontal and gyrus rectus regions, and the sections were stained by the usual Levaditi method. The great majority of the organisms occurred in the nerve-cell layers of the cortex; there did not seem to be any relationship between their numbers and the severity of the general paralytic process.

D. K. HENDERSON.

**THE NEUROPATHIC INHERITANCE.** F. W. MOTT, *Journ. Mental Science*, April 1913.

AN interesting paper dealing with the neuropathic inheritance in relation to insanity, genius, suicide, degeneracy, &c. An

account, containing many tables and pedigrees, is given of the investigations of relatives in the London County Asylums. The neuropathic inheritance in relation to general paralysis and the creation of the neuropathic inheritance are discussed at length.

The author has found that there is a signal tendency in the insane offspring of insane parents for the insanity to occur at an earlier age and in a more intense form; the form of insanity being usually either congenital imbecility or primary dementia of adolescence.

J. STANLEY HOPWOOD.

**MANIC - DEPRESSIVE PSYCHOSIS. GRAVES' DISEASE AND**

(307) **MARIE'S ATAXY; FRIEDREICH'S DISEASE.** (*Psicosi maniaco-depressiva, morbo di Basedow e atassia tipo Marie; malattia di Friedreich.*) P. ANGELO, *Riv. ital. di Neuropatol., Psichiatria ed Elettroteter.*, 1913, vi., p. 97.

A RECORD of a case of cerebellar ataxia in a woman which developed in convalescence from typhoid fever at the age of 22, and of a case of Friedreich's disease in her brother which had first appeared at the age of 11 years.

The woman's thyroid had been enlarged since childhood, but it was not until after typhoid that the other symptoms of Graves' disease appeared. The manic-depressive psychosis followed an attempted rape a year previously, and was much aggravated by the attack of typhoid.

J. D. ROLLESTON.

**THE BLOOD-PRESSURE IN THE INSANE.** (*La pressione sanguigna*

(308) *negli alienati di mente.*) E. A. SAGINI, *Riv. ital. di Neuropat., Psichiatria ed Elettroteter.*, 1913, vi., p. 169.

THE writer examined the blood-pressure of 38 women and 33 men, aged from 30 years upwards, suffering from various forms of mental disease, with Riva-Rocci's sphygmomanometer. His conclusions are as follows:—

1. There is no constant relation between the number of pulse beats and the degree of blood-pressure.
2. In all mental diseases advanced age determines a rise of blood-pressure (*cf.* J. Turner, *Review*, 1909, vii., p. 677).
3. In all mental diseases the curve of blood-pressure in the right arm is a little higher than that in the left.
4. Occasional excitement and emotion of a certain degree is followed by a rapid rise of pressure without a corresponding variation in the pulse.
5. In every form of mental disease food always causes a fall of blood-pressure.

6. The mean blood-pressure of epileptics is lower than that found usually in normal individuals. Their pressure varies, but never reaches a stage of hypertension, even in the period which precedes or follows the fit.

7. It cannot be affirmed that a definite relation exists between mental conditions and the blood-pressure, nor that constant variations exist in the blood-pressure in relation to every form of mental disease, but there is an obvious tendency to increased pressure in paranoia, alcoholic insanity, and hysteria, and a tendency to low pressure in depressive states.

J. D. ROLLESTON.

**THE PSYCHO-PATHOLOGY OF EMOTIONAL PSYCHOSIS DURING (309) THE WAR.** (*Sulla psico-patologia dell'emozione durante la guerra.*) LUIGI DANEQ, *Rassegna di Studi Psichiat.*, Vol. iii., F. 2, Marzo-Aprile 1913.

THERE does not exist any mental disorder which may be considered different from the others and characteristic of war. Mental disease only develops in war in persons with weak brains; in persons with strong brains war confers an immunity against the graver effects. The author observed chiefly depressive psychoses in the African War.

A. NINIAN BRUCE.

**INSANITY IN TWINS.** (*Quelques réflexions sur les folies gémellaires (310) et familiales.*) Prof. BAJENOFF (Moscow), *Arch. internat. de Neurol.*, 1913, xi., sér. 1, p. 213.

THE writer reviews the literature, and gives a brief account of twins who developed dementia præcox at puberty, one of them being in Constantinople, while the other was in Egypt. As in other cases, hereditary predisposition caused a simultaneous evolution of the disorder without the co-operation of any mutual psychical influence (*cp. Review*, 1913, xi., p. 176).

J. D. ROLLESTON.

**THE USE OF CODEIN IN MENTAL THERAPEUTICS, IN (311) PARTICULAR IN MELANCHOLIC STATES.** (*De l'emploi de la codéine en thérapeutique mentale en particulier dans les états mélancholiques.*) A. LEROY, *Journ. de Neurol.*, Ann. 17, No. 10, May 20, 1912, p. 181.

THE author comes to the following conclusions from his observations with phosphate of codein in mental disorders.

1. A dose of 5 to 10 centigrammes given subcutaneously produces no sedative effect in maniacal states.

2. It seems to have only a variable and very uncertain action on the disorders of general sensibility and the mental pain of states of melancholia.

3. It is remarkably well tolerated in depressed states, large doses often producing little or no effect. W. BOYD.

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## Review.

**SCLERO-CORNEAL TREPHINING IN THE OPERATIVE TREATMENT OF GLAUCOMA.** ROBERT HENRY ELLIOT, M.D. Lieut.-Colonel I.M.S. George Pulman & Sons, Ltd. London, 1913, pp. 117. Pr. 7s. 6d. net.

IN a sense this is a little book; on the other hand, relatively to its subject, it may quite well be called a big book, as its 117 pages of fairly close print are devoted to the one operation of sclero-corneal trephining in glaucoma, in regard to which it may be regarded as an exhaustive treatise containing the results of the author's unrivalled experience in the procedure which is associated with his name.

There are twelve chapters, of which the second—the longest—and the last are reprinted papers by other writers, and deal with the history of the operation, and the importance of the site of application of the trephine. In the remainder the author gives a very full account of the indication and preparations for the operation, his own technique and the suggested modifications of others, the possible complications and the after-management. There are also chapters on the diagnosis of glaucoma in Southern India, on the method of compiling statistics, and on the results which show the great thoroughness with which the author has dealt with his subject.

Numerous illustrations and an excellent index are provided, and the book may be heartily recommended to those who wish to consult a complete account of this important operation.

H. M. TRAQUAIR.

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## Notice of Meeting.

A MEETING of the International League against Epilepsy will be held in the House of the Royal Society of Medicine, 1 Wimpole Street, London, W., at 10 A.M. on Wednesday, 13th August.

The programme will include the discussion of the Reports of the National Committees of the League and other papers.

By the kind invitation of the managing committees of the Institutions, two visits have been arranged; the first on Wednesday afternoon, 13th August, to the London County Council Epileptic Colony at Epsom, Surrey; and the second to the David Lewis Epileptic Colony, Sandle Bridge, near Alderley Lodge, on Thursday, 14th August.

## BOOKS AND PAMPHLETS RECEIVED.

Becker, Wern. H. "Spezielle Prognose der Geisteskrankheiten" (*Sammlung Hoche*, Bd. x., H. 3, 1913). Carl Marhold, Halle a. S. Pr. M. 1.00.

Cyriax, E. F. "Medical Gymnastics considered as a Prelude to Physical Education in the Treatment of Mentally Deficient Children" (*Med. Press and Circular*, May 14, 1913).

Cyriax, E. F. "La gymnastique médicale considérée comme prélude à l'éducation physique des enfants arriérés" (Congres Internat. de l'Education Physique, Paris, Mars 17-20, 1913).

Flexner, Simon. "The results of the serum treatment in thirteen hundred cases of epidemic meningitis" (*Journ. Exp. Med.*, Vol. xvii., No. 5, 1913).

Flexner, Simon, and Clark, Paul F. "Paralysis in a dog simulating poliomyelitis" (*Journ. Exp. Med.*, Vol. xvii., No. 5, 1913).

Franz, S. Ivory. "The functions of the cerebrum" (*Psychol. Bulletin*, Vol. x., No. 4, April 1913, pp. 125-138).

Franz, S. Ivory. "Mental Status of some Cranks" (*Lawyers' Magazine*, Rochester, N.Y., Vol. 19, No. 12, 1913).

Hirschfeld, Magnus, and Burchard, Ernst. "Der sexuelle Infantilismus" (*Juristisch-psychiat. Grenzfragen*, Bd. ix., H. 5, 1913). Carl Marhold, Halle a. S. Pr. M. 1.20.

Kinberg, Olaf. "Über das strafprozessuale Verfahren in Schweden bei wegen Verbrechen angeklagten Personen zweifelhaften Geisteszustandes nebst Reformvorschlägen" (*Juristisch-psychiat. Grenzfragen*, Bd. ix., H. 2/4, 1913). Carl Marhold, Halle a. S. Pr. M. 3.60.

Loudon, Julian. "Acromegaly with localised muscular atrophy" (*Canadian Pract. and Review*, April 1913).

Stern, Ludwig. "Kulturkreis und Form der geistigen Erkrankung" (*Sammlung Hoche*, Bd. x., H. 2, 1913). Carl Marhold, Halle a. S. Pr. M. 1.60.

Wickman, Ivan. "Acute Poliomyelitis; Heine-Medin's Disease" (*Nervous and Mental Disease Monograph Series*, No. 16). Translated by Dr Maloney, New York, 1913. Pr. \$3.00.

*Internat. Ztschr. f. Ärztliche Psychoanalyse*, J. 1, H. 3, Mai 1913. Hugo Heller & Cie, Leipzig and Vienna.

*Travaux de la clinique psychiatrique de l'Université Imperiale de Moscou*. Sous la direction de Th. Rybakow. No. 1, 1913, Moscow.

*The Training School*, Vol. x., No. 9, May 1913.

# **Review**

of

# **Neurology and Psychiatry**

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## **Original Articles**

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### **THE SPREAD OF INFECTION BY THE ASCENDING LYMPH STREAM OF NERVES FROM PERIPHERAL INFLAMMATORY FOCI TO THE CENTRAL NERVOUS SYSTEM.**

By **Drs ORR, ROWS, and STEPHENSON.**

*(From the Laboratories of Prestwich and Lancaster Asylums.)*

(With Plates 21-25.)

SINCE experimental observation has established the fact that inflammation of the central nervous system is easily induced by infection of the ascending lymph stream of nerves, it would seem that the views regarding the etiology of inflammatory lesions of the cerebro-spinal axis must undergo considerable revision, and that an insufficient degree of importance has so far been attributed to the rôle and wide-reaching results of lymphogenous infection. That the spinal cord and brain are exposed to infection along this path cannot be doubted. This view is based upon both clinical and experimental data; and its value in connection with the elucidation of the etiology of some nervous lesions may now receive more recognition, seeing that the range of application of the hæmatogenous theory is becoming more limited. To take one example: acute anterior poliomyelitis is no longer regarded by neurologists as a hæmatogenous infection of the spinal cord, with a special selectivity for the motor nuclei. Recent work shows conclusively that the inflammatory phenomena can only be the result of a lymphogenous infection.



The results of experimental work (1), (2), (3) have shown that infection of the lymph system of peripheral nerves causes an ascending neuritis which spreads upwards to pass over the posterior root ganglia and along the spinal roots to the cord. The tissue which shows the greatest degree of inflammation is the loose areolar tissue covering the perineurium, the ganglion capsule, and the dura mater. The adventitial elements of the veins and capillaries contribute very largely to the inflammatory exudate. Within the cord the inflammation diminishes in degree from without inwards.

The clinical cases in this present paper form a direct continuation of experiments carried out on animals to demonstrate the facility with which infection spreads along the lymph channels of nerves to the spinal cord. They in no way widen the scope of the original research; they merely apply to the human subject the phenomena previously observed, and the principles derived from that research. It will be seen that not only is the same path of infection demonstrable, but that there is a perfect similarity in the type of reaction which varies with the potency of the irritant.

CASE 1. *Carcinoma of the Tongue with Suppuration in the Tissues below the Chin.*—In this case an operation on the tongue had been performed before the patient was admitted into the asylum. Soon after admission an abscess developed in the sub-maxillary region, and was opened on the 15th July 1912; another incision was required a month later. The patient died on the 24th November 1912. At the post-mortem examination all the tissues in the floor of the mouth were found to be bound together by the malignant growth and the accompanying inflammation. A considerable quantity of pus was present in the subcutaneous tissues and amongst the muscles of the neck. There was no gross lesion of the brain; the pia mater was congested, slightly thickened, and, over the pons Varolii, had a distinctly yellow appearance. Broncho-pneumonia was present in the right lung.

The tissues examined in this case included the twelfth, seventh, and fifth cranial nerves, *i.e.*, nerves leading from the septic focus to the central nervous system; the pons Varolii and the medulla oblongata; the spinal cord, together with the nerves and the posterior root ganglia connected with its cervical portion. The

part of the hypoglossal nerve was taken from near the angle of the jaw, and that of the facial nerve from just outside the mastoid foramen. In both these the connective tissue cells of the epi- and peri-neurium and the cells of the adventitial sheath of the veins and capillaries were reacting actively to the irritant derived from the septic focus under the chin. Considerable collections of cells were present around the vessels and along the trabeculae of the sheath of the nerves. Some of these had a rounded or indented nucleus containing little chromatin and a faintly-stained cell-body; mixed with these were small cells with deeply-stained nuclei and a small amount of well-stained protoplasm around them. In some of the capillaries the endothelial cells were much enlarged and rounded, and projected into the lumen of the vessel. Within the nerves the reaction was much less intense: the cells of the adventitial sheath of the veins and capillaries were increased in number and were swollen; in some areas typical plasma cells were seen. The neurilemma cells were swollen. A portion of the seventh nerve which included the geniculate ganglion was examined also. Here the inflammatory condition was less acute. There was some proliferation of the cells of the epi- and peri-neurium and of the adventitial sheath of the veins and capillaries: the capsular cells around the nerve cells also showed signs of irritation.

The most intense inflammatory reaction in this case was found around the fifth nerves outside the dura mater and in the Gasserian ganglia. The cells of the sheath of the nerves and of the peri-neurium surrounding the nerve bundles exhibited a remarkable proliferative activity, and large collections of reaction cells had appeared (Photo 1). Many of these were of the polyblast type, with the rounded or indented nucleus containing little chromatin and a faintly-stained cell-body. Mixed with these were small cells with a rounded, deeply-stained nucleus surrounded by a very little well-stained protoplasm. Many stages between these two forms of cells could be observed. In some instances the protoplasm of the cells had assumed a reticulate structure, and many contained distinct refractile purple granules. Frequently the cell-membrane had burst and the granules were escaping. They were especially numerous where hæmorrhage had occurred and blood-pigment was present. It is probable that their appearance was due to the fact that they had acted as scavengers, and had imbibed

some of the blood-pigment. It is possible that these granules correspond to the granules of hæmosiderin which Bonfiglio has found in plasmacytes in various pathological conditions of the central nervous system.

The reaction within the Gasserian ganglia was less than that around the nerves outside the dura mater, but it was still considerable around the bundles of the nerve as they entered the ganglia. Polyblasts were less in evidence, and large rounded cells with a darkly-stained nucleus and much well-stained protoplasm were the most prominent feature. These cells closely resembled the pseudoplasma cells described by Pappadia as being numerous in acute inflammatory conditions, and as they were associated with polyblasts, and with small cells having a darkly-stained nucleus and very little protoplasm around it, it is probable that they owed their origin, not to mono-nuclear leucocytes, as suggested by this author, but to the proliferating connective tissue and adventitial cells, as did the cells amongst which they were lying. Amongst the tissues of the ganglia many of the reaction cells exhibited the characters of plasma cells. The capsular cells around the nerve cells were proliferating. The nerve cells themselves showed various stages of injury: coagulation necrosis and homogeneous atrophy of the nucleus were seen frequently. In other nerve cells the chromophile elements had disappeared and neuronophagy had commenced.

The degree of the irritation in the pia mater over the pons Varolii was much less than that in the structures already described. Photo 2a shows an infiltration of the membrane with small round cells, some of them possessing the characters of plasma cells. The irritation extended from the pia mater along the adventitial sheath of the vessel as it passed into the pons. This result, produced by toxins derived from the suppurating focus under the chin, which had reached the pons by ascending along the fifth nerve, resembles very closely the condition produced experimentally in animals when an acute inflammatory process had followed the bursting of a celloidin capsule, containing a culture of micro-organisms, placed close to an intervertebral foramen. The comparison of the photographs (Photos 2a, 2b),<sup>1</sup> one illustrating a condition found in a

<sup>1</sup> Photos 2a and 2b should be compared with Photo 2c, from a section kindly lent by Dr Coupland, of Lancaster, and sent to him by Professor Pettersson, of Stockholm.

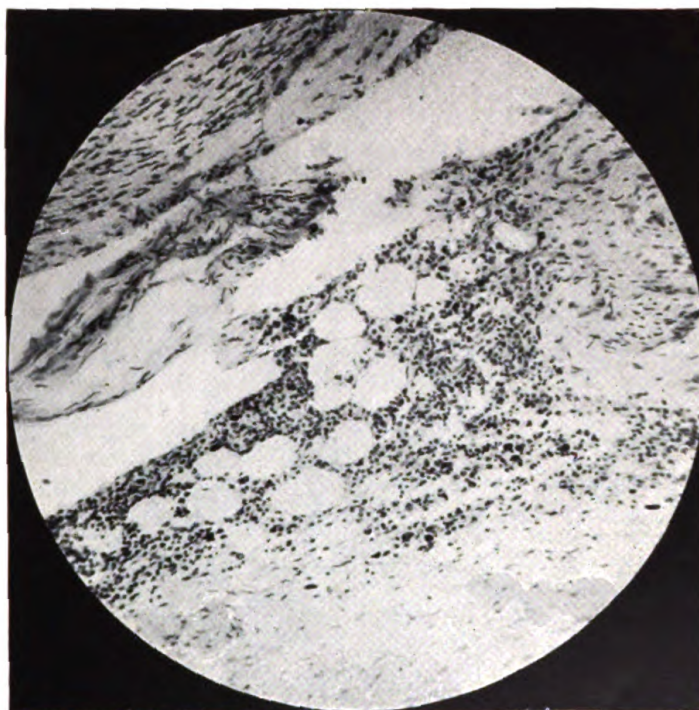


PHOTO 1.—Inflammatory Reaction in the Perineurium of the 5th Cranial Nerve.



PHOTO 2a.—Vessel passing from Pia Mater into Pons Varolii.



PHOTO 2b.—Compare with Photo 2a.



PHOTO 2c.—Experimental Acute Poliomyelitis in Monkey. Vessel passing into White Matter of Cord. Compare with Photos 2a and b.

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case of carcinoma of the tongue with suppuration in the adjacent tissues in the human subject, and the other a condition produced experimentally in a rabbit, is interesting and suggestive. Within the pons the vessels were dilated to a great degree, and in many of them the cells of the adventitial sheath exhibited signs of reaction. Chromatolysis had occurred in many nerve cells; the neuroglia cells were proliferating.

Examination of the posterior root ganglia and the nerves connected with the cervical portion of the spinal cord demonstrated that the toxins derived from the focus of suppuration had given rise to an intense reaction, which was especially marked in the epidural tissue and at the proximal pole of the posterior root ganglia (Photo 3). This again corresponded closely to the results obtained by experiments on animals. The reaction inside the dura mater was slight, as compared with that nearer the focus of origin of the irritant. The pia mater was infiltrated by small cells with deeply-stained nuclei: some plasma cells were present. This irritation of the pia mater was most marked in the cervical and upper dorsal regions, and lessened over the lowest segments of the spinal cord. Within the spinal cord the vessels were dilated, and there was some irritation of the cells of their adventitial sheath (Photo 4).

CASE 2. *Erysipelas of the Face*.—This patient was an old woman who had been in the asylum for many years. On the 26th May 1912 she became very ill; her temperature rose to 104°: on each side of the nose a red flush appeared, which spread rapidly. The tissues of the face became œdematous, and had the typical appearance of erysipelas. She died on the 1st June 1912. At the post-mortem examination it was found that the tissues of the anterior half of the scalp, of the whole of the face and below the chin, were puffy and œdematous: much of the subcutaneous tissue had necrosed, and a pale sanious fluid poured out when an incision was made into the skin. There was no gross lesion of the brain; patches of congestion were present in the pia mater over the frontal and the left temporal regions. Nothing of importance was noticed in the other organs.

The tissues examined in this case were the fifth nerves outside the Gasserian ganglia, the Gasserian ganglia, and the pons Varolii. In the fifth nerves outside the Gasserian ganglia signs of an inflammatory reaction were present in the form of hæmorrhages

into the epineurium, and a proliferation of the cells of the epi- and peri-neurium, and of the adventitial sheath of the vessels contained in them. This proliferation had led in some areas to large collections of reaction cells. The form of the cells varied from the rounded cell, with a deeply-stained nucleus surrounded by a little protoplasm, to cells with a larger, paler nucleus and a fairly large cell-body. At the same time there were a large number of cells with a small deeply-stained nucleus and a large cell-body containing quantities of refractile purple granules. In many instances the limiting membrane of these cells had broken, and the granules were escaping. They were again especially numerous in the neighbourhood of hæmorrhages. In the sheath of the Gasserian ganglia collections of micro-organisms were found, and accompanying these there was an acute inflammatory reaction with large collections of cells. Amongst these were cells showing various stages of reaction, from the small cell with deeply-stained nucleus to the typical polyblast (Photo 5). Many of the large cells contained purple granules. An inflammatory reaction could be followed between the nerve bundles passing into the ganglia. Within the ganglia the evidences of irritation were less acute. Proliferation of the connective tissues and of the cells of the adventitial sheath of the vessels was taking place. The capsular cells were more numerous than normal, and in many instances surrounded the nerve cells in several rows. The nerve cells exhibited marked chromatolysis, and many nuclei were in a condition of homogeneous atrophy.

In the pia mater covering the pons Varolii the vessels were much dilated, and in some areas the membrane was infiltrated with small round cells having a deeply-stained nucleus and only a little protoplasm. Within the pons the vessels were dilated, and the cells of the veins and small vessels showed signs of reaction. Chromatolysis was present in the nerve cells; the neuroglia cells were proliferating, and some were surrounded by a considerable amount of protoplasm.

CASE 3 was one of *juvenile general paralysis*, who developed bedsores over the sacrum, right hip, and elbow three weeks prior to death. The sacral bed sore involved the muscles, which were necrosed. At the post-mortem examination, on removing the spinal cord, great excess of cerebro-spinal fluid escaped. The outer surface of the dura mater was inflamed, and there was





PHOTO 4.—Inflammatory Reaction in Wall of Vessel in White Matter of 7th Cervical Segment.

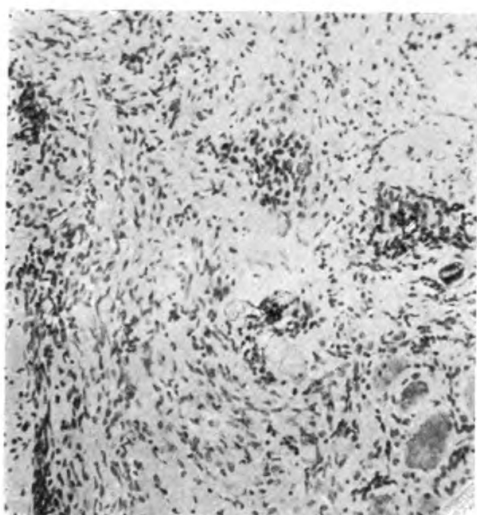


PHOTO 3.—Inflammatory Reaction at the Proximal Pole of 1st Cervical Posterior Root Ganglion.

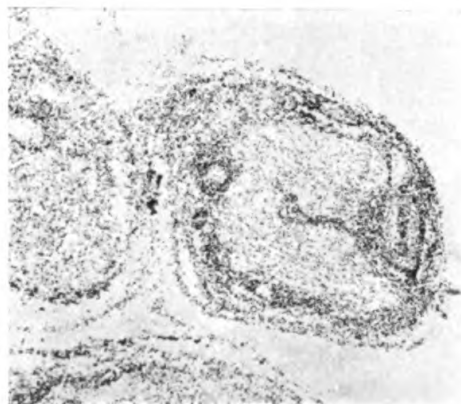


PHOTO 6.—4th Dorsal Nerve. Reaction of the Peri- and Endoneurium Proliferation of Neurilemma Nuclei.

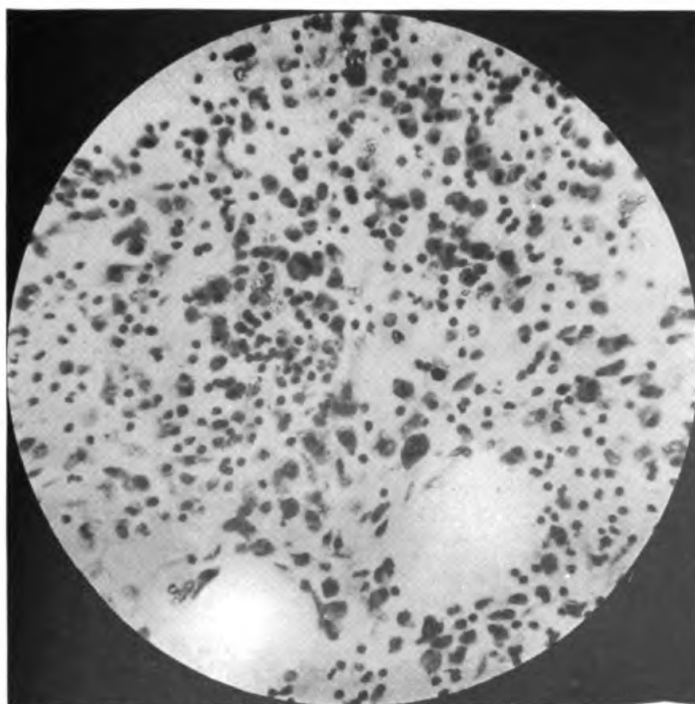


PHOTO 5.—Inflammatory Reaction of Sheath of Gasserian Ganglion.





a small quantity of pus in the lowest portion of the spinal canal. From this the dura mater and nerve sheaths had been infected, for micro-organisms could be followed in the epineural tissue to the points at which the nerves pierce the dura. The presence of these organisms had led to an inflammatory reaction most marked in the epidural tissues. Here hæmorrhages were present, and the cells of the trabeculæ of the connective tissue were proliferating actively; in some areas considerable masses of cells had accumulated. The cells were irregular in shape, and differed greatly in staining reaction. Some resembled polyblasts, but cells with a more deeply-stained nucleus and a considerable quantity of protoplasm surrounding it were more numerous. Mixed with these were cells with a deeply-stained nucleus and very little protoplasm. Within the dura mater no organisms were seen, but the inflammatory reaction was still very marked. The cells of the perineural sheath were proliferating actively, forming collections of cells, with a rounded nucleus containing much chromatin, and a large cell-body around it (pseudoplasma cells of Pappadia). Within the nerve and within the posterior root ganglia the reaction was less. The adventitial cells of the small vessels were reacting, and many cells resembling plasma cells were present. The capsular cells were proliferating, and lay in layers around the degenerating nerve cells. In the pia mater around the lower segments of the spinal cord there was some infiltration by small round cells. Within the spinal cord the cells of the adventitial sheath of the small vessels and the neuroglia cells were reacting. These signs of irritation diminished higher up the spinal cord, and in the cervical segments they were very slight.

CASE 4. H. F.—*Case of Tubercular Nodules of Pleura.*

*History.*—He is said to have had a severe attack of "influenza" nine months before admission, and was forgetful and strange in manner for four months. Five weeks before admission had a "strong fit," followed at an interval of a week by another fit. Had been in bed since. On admission he was feeble and shaky, incoherent and confused, little idea of time or place, and wandered restlessly about his room. Temperature normal, knee-jerks exaggerated, tongue tremulous, pupils dilated and sluggish; mouth in a septic condition with pyorrhœa alveolaris; there was a trace of albumen in the urine. He vomited brownish fluid on 27th May;

his temperature went up to 100° F., and he died the same evening.

The diagnosis made on admission was acute confusion or general paralysis.

*Post-mortem Appearances.*—The dura was tensely filled. The pia arachnoid was thickened and milky; decidedly more adherent than normal. At the base the thickening was most marked; over the left temporal lobe the pia arachnoid was adherent to the dura. The cerebro-spinal fluid was very scanty. The cerebral convolutions were much flattened. On section the most extreme oedema of white matter was apparent; the ventricles were small, with very granular walls; on the floor of the fourth ventricle the granulations were particularly large. The vessels were a little thickened. In the right pleura there were rows of small hard tumours from  $\frac{1}{8}$  in. to 1 in. in diameter. The larger nodules had softened centres, and contained pus-like material. These nodules occurred in parallel rows in the parietal pleura, also on the pleural surface of the diaphragm, the outer layer of the pericardium, and on the visceral pleura. The lung substance appeared normal.

*Microscopic Anatomy.*—One of the tumours in the pleura was examined and found to be composed of fibrous tissue, lymphocytes, connective tissue cells with large clear nuclei, and giant cells. No bacilli are found by Ziehl-Nielsen staining.

*Dorsal Cord.*—There was proliferation of the endothelial nuclei on the inner surface of the dura mater. The perineurium of the spinal roots and the septa between the nerve bundles were deeply infiltrated with many lymphocytes, amongst which some plasma cells were scattered; and there was marked proliferation of the neurilemma nuclei (Photo 6), which were spindle shaped, often irregular in contour, and frequently showed degenerative changes. The greatest reaction in the spinal roots occurred where they pierced the dura mater (Photo 7). The pia arachnoid was full of lymphocytes (Photo 9), and plasma cells occurred to a much less extent. These were not quite typical. The adventitial spaces of the vessels were packed with lymphocytes. A group of three giant cells lying in the pia arachnoid is shown in Photo 8.

Within the cord there was a high degree of adventitial proliferation and infiltration (Photo 10). Similar changes were present in all the septa passing from the pia arachnoid into the

cord. Two types of reaction cell were present. One had a faintly-staining large clear nucleus, a pale green nuclear membrane, and a pink nucleolus, by Pappenheim's method; the other was a typical lymphocyte. Plasma cells occurred occasionally, and near the cord-margin. There was much neuroglial proliferation. Marchi's method showed considerable myelin degeneration scattered uniformly throughout the cord.

*Cervical Region.*—Here there was much less reaction in the pia arachnoid and in the adventitial sheath of the vessels. The reaction cells were almost all lymphocytes. A few giant cells occurred. There were a few lymphocytes in the outer sheath of the vessels in the cord substance, and a slight degree of proliferation of adventitial elements. Occasionally small hæmorrhages were seen in the white matter. The neuroglia was proliferating and some neuroglial giant cells occurred in the vicinity of the hæmorrhages.

*Lumbar Cord.*—The vessels of the spinal roots showed a slight degree of lymphocytic infiltration of the adventitia. There was little alteration of the peri- and endo-neurium. Lymphocytes were numerous in the pia arachnoid, and there were giant cells in the adventitial sheath of the vessels. Within the cord the vessels were dilated and engorged. There were some lymphocytes in the external coat of the larger vessels, and the endothelium of the capillaries showed proliferative changes. The neuroglia cells were increased in number. No hæmorrhages were present.

CASE 5. J. P.—*Case of Tubercular Lumbar Abscess.*—On admission he had delusions of grandeur, wealth, and ability; these were soon lost, and he became sullen and impulsive; later, he was demented and had lost all idea of time and place. Two years after admission he developed pleurisy at base of left lung, and from this time onward he was considered to be suffering from pulmonary phthisis. In February 1912 a lumbar abscess was noted, and it was aspirated in May. On 12th June he had several attacks of vomiting, retraction of the head, sluggishly reacting pupils, conjugate deviation of head and eyes to the left, knee jerks exaggerated, and ankle clonus. He died on 14th June.

*Post-mortem Appearances.*—Pia arachnoid was slightly thickened and opaque, cerebro spinal fluid much increased and semi-turbid. Brain (1,185 gms.) showed some atrophy of convolutions, grey matter darker than normal, white matter very soft and

oedematous. The ventricles were a little enlarged, and very prominent granulations were present on the ependyma—especially in the fourth ventricle. The vessels appeared normal. The spinal pia arachnoid was thickened. The vessels were much engorged, and the cord substance very soft. There was an abscess in the right lumbar region—between the lowest rib and ilium; its exact origin was not determined—no diseased bone was found. The lungs were both firmly adherent to the chest wall, and showed many small hard tubercular masses. The mesenteric glands were enlarged and calcified.

*Microscopic Anatomy.*—In the wall of the lumbar abscess there were giant cells and tubercle bacilli present.

*Lumbar Cord.*—The spinal roots were practically normal: nothing unusual was present beyond congestion and dilatation of the vessels. The pia mater and adventitial spaces were infiltrated with lymphocytes; a few plasma cells were present. Some giant cells were present in the perivascular tissue. There was marked congestion of the vessels in the cord substance, and the adventitia showed a mild degree of proliferation. The neuroglia cells were markedly increased in number: no hæmorrhages were present.

*Dorsal Cord.*—The perineurium of the spinal roots showed a high degree of inflammatory reaction (Photo 11). The exudate consisted of lymphocytes, proliferated connective tissue cells, and plasma cells. Rows of lymphocytes were seen in the septa between the nerve bundles. The neurilemma nuclei were greatly increased in number; and the vessels were engorged and dilated. The pia arachnoid was filled with proliferated cells and lymphocytes, as were the adventitial spaces of the vessels. The reaction cells were for the most part lymphocytes, but a considerable number of plasma cells were present. These were not quite typical, as the nucleus was smaller and darker than normal, and the protoplasm was not always vacuolated. Giant cells occurred in the pia. There was a considerable degree of inflammation in the septa passing from the deep surface of the pia into the cord. The adventitial sheath of the vessels in the cord showed a high degree of proliferation, and its spaces were filled with large clear nuclei or with lymphocytes (Photo 12). There were some hæmorrhages in the white matter, and in the fourth dorsal segment, in the column of Burdach, near the periphery of the cord, there was a small isolated patch of myelitic softening. The neuroglia was proliferated,



PHOTO 7.—4th Dorsal Nerve Root piercing Dura Mater.  
1, Dura Mater ; 2, Proliferated Neurilemma Nuclei ; 3, Extra-dural Tissue.



PHOTO 9.—4th Dorsal Segment. Infiltration of Pia-Arachnoid and  
of the Adventitial Sheath of the Cord Vessels.

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and Marchi's method showed much diffuse degeneration, which was more prominent round the outer portions of the cord. There was a considerable degree of myelin degeneration in the spinal roots also.

*Cervical Cord.*—Here the inflammatory reaction in the soft membranes was well marked, but of less degree than in the dorsal region. The perineurium of the spinal roots was also affected, and the cell types were the same as noted in the dorsal region. Giant cells again occurred in the adventitia of the vessels. Hæmorrhage was present in the spinal roots, and in both grey and white matter of the cord.

*Cerebrum.*—The pia arachnoid was infiltrated with plasma cells and lymphocytes. There were no giant cells. Plasma cells were also found in the adventitial sheath of the larger vessels of the cortex, but only near the surface; not in the deeper layers. The endothelial nuclei of the capillaries were increased in size and number; no plasma cells were seen in connection with them.

CASE 6. C. L.—*Case of Cancer of Œsophagus.*—In the Œsophagus there was a flat-topped growth at the level of the crossing of the left bronchus; some ulceration of the surface of the tumour had occurred, and also of the mucous membrane above the growth. The cervical lymphatic glands were enlarged. The spinal cord appeared to be softened in the cervical region and the vessels were engorged, but there was no evident meningitis. The dura mater was thickened, with recent roughening and loss of polish in the posterior cranial fossa. There was pus under the pia arachnoid at the posterior border of, and on the upper surface of the cerebellum, and at the tip and along the inferior surface of temporal lobe of the cerebrum. Over the upper part of the frontal and parietal lobes the pia arachnoid was much thickened. The brain weighed 1,230 gms. Its convolutions showed great atrophy. There was marked œdema of the white matter, and a small softening in the left lenticular nucleus. There was much thickening with calcareous deposit in the large vessels at the base. There was red staining of the heart valves and of the intima of the aorta. The left kidney weighed 70 gms., the right 60 gms.; the capsules were adherent, and the cortex much atrophied.

*Microscopic Anatomy.*—The tumour in the Œsophagus was an epithelioma; adhering to its surface there were large masses of micro-organisms. Ulceration of the Œsophagus was seen above



the level of the epithelioma. There was marked proliferation of tissue cells in this part of the wall of the œsophagus.

*Cervical Cord.*—In the epidural tissue the vessels were greatly congested, and there were extensive hæmorrhages. Many micrococci (Photo 13) were present, arranged in pairs or short chains, and many degenerate cells, in all probability polymorphonuclear leucocytes. The outer layers of the dura were infiltrated with reaction cells of the same type (Photo 14), and there were many cocci. Some mast cells were present in the dural tissue. The perineurium of the spinal roots was infiltrated with small round cells possessing a small deeply-staining nucleus. This infiltration extended into the proliferated septa between the nerve bundles, and in the case of one anterior root there were micrococci, similar to those in the dura, lying amongst the reaction cells. The neurilemma nuclei were greatly proliferated, as were the capsular cells surrounding the posterior root ganglion nerve cells (Photo 15). The latter showed acute chromatolysis, and were almost devoid of chromophile substance.

There were small groups of micrococci in the pia arachnoid and many degenerate polymorphonuclear leucocytes, lymphocytes, and proliferated connective tissue cells. Within the cord there was a high degree of adventitial proliferation. Lymphocytes were few in number, and there were no plasma cells. The neuroglia was proliferated, and in many the nucleus was swollen, rich in chromatin, while the cell-body was enlarged and possessed branching processes.

*Dorsal Cord.*—The dura mater was normal. The pia arachnoid was infiltrated with polymorphonuclear leucocytes and lymphocytes, the former occurring in greater number than the latter. Here and there were groups of degenerated leucocytes. In the spinal roots the blood vessels were engorged, and there were many polymorphonuclear leucocytes in the perineural sheath. The adventitial and connective tissue elements were markedly proliferated. The neurilemma was normal. There was much proliferation of the adventitia within the cord, and in places this sheath was infiltrated with lymphocytes. The endothelial cells of the capillaries were swollen and proliferated. Small hæmorrhages were frequently seen. The neuroglial cells, especially round the cord margin, were enlarged, and the cytoplasm was prolonged into branching processes.

*Lumbar Region.*—There were many polymorphonuclear leucocytes in the pia arachnoid, and lymphocytes were present

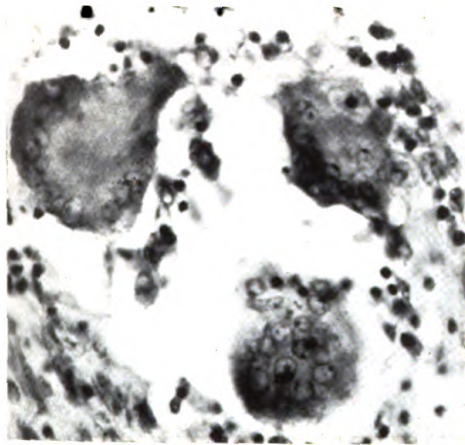


PHOTO 8.—4th Dorsal Segment. A group of Giant-Cells in the Spinal Pia-Arachnoid.



PHOTO 10.—4th Dorsal Segment. Infiltration of the Adventitial Sheath; Increase of Neuroglial Nuclei.

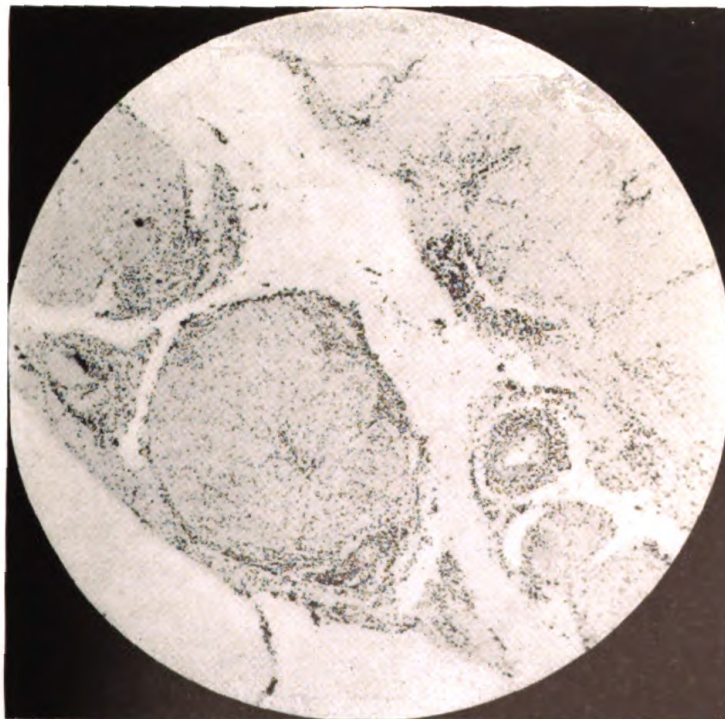


PHOTO 11.—4th Dorsal Segment showing a Posterior Root Bundle. Infiltration of the Perineurium.

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in somewhat fewer numbers. The vessels were engorged here, and also in the spinal roots, whose fibrous sheaths were filled with both leucocytes and lymphocytes. Here and there in both pia and spinal roots there was a moderate degree of adventitial proliferation. The neurilemma was normal. Within the cord the vessels were engorged, and a very few lymphocytes were present in the adventitial spaces. Small hæmorrhages were present in the grey matter.

*Medulla.*—There were well-marked changes in the pia arachnoid. Polymorphonuclear leucocytes, polyblasts, and micrococci were present. There was proliferation of the adventitial coat of the vessels; the middle coat of the larger vessels showed hyaline thickening, and in some the intima had so increased in thickness as to almost occlude the lumen. Within the medulla there was some adventitial infiltration with lymphocytes, and the endothelium of the capillaries was swollen and proliferated. Some of the vessels of the pia and medulla were filled with polymorphonuclear leucocytes.

*Cerebellum.*—In the sub-arachnoid space there was a thick inflammatory exudate, composed for the most part of degenerate polymorphonuclear cells. There were no micro-organisms, no polyblasts, and no plasma cells. In the deeper parts of the sulci the exudate was much less in quantity, and at the bottom the reaction was very slight. There was a slight degree of infiltration of the adventitial sheath with cells which had the appearance of degenerate polymorphonuclear cells.

*Cerebral Cortex.*—Here the inflammatory reaction was less. There were scattered hæmorrhages in the cortex, and collections of polymorphonuclear leucocytes in the pia arachnoid.

CASE 7. S. C. H., aged 34.—*General paralysis of the insane*: of about two years' duration. Fourteen days previous to death he developed hemisudosis of the right side of the head and neck, which rapidly involved the entire right side of the body. At the same time a right dorsal herpes zoster made its appearance, extending from the angle of the scapula through the axilla to the sternum. There was marked dullness of the base of the right lung. At the post-mortem examination all the signs of general paralysis were found, and in addition a right-sided empyema.

*Right Intercostal Nerves* (fourth, fifth, sixth).—The loose areolar tissues covering the perineurium showed abundant evidence of

inflammation. The vessels were congested, and at many points there were hæmorrhages. No thrombi were present. The inflammatory exudate had the same distribution as we have already noted in nerves infected experimentally, and its character was that of a subacute reaction passing on to the chronic stage. There were no polymorphonuclear leucocytes present. There were many small lymphocytes, numerous plasma cells, and fibroblasts. The endothelial cells lining the trabeculæ had proliferated. Mast cells were frequently met with.

The large majority of the plasma cells had undergone repressive changes. They were paler than normal, distorted, and the nucleus was rarely typical. As a rule it was small in size, round, irregular, or kidney-shaped, and stained very darkly. Many of the altered plasma cells resembled compound granular corpuscles, of which there were many examples. The mast cells were of varying shape—round, oval, or provided with elongated processes filled with granules—the so-called clasmatocytes of Ranvier. The adventitial elements of the veins and capillaries showed active proliferative changes and plasma-cell formation. Very frequently these cells lay in clusters round the vessels.

There was a considerable degree of inflammatory reaction of the perineurium and its prolongations between the nerve bundles. The connective tissue nuclei were swollen, elongated, and immature fibroblasts were present. The adventitia of the veins and capillaries had reacted. The neurilemma cells showed signs of irritation. Their nuclei were swollen, round, and pale, while the protoplasm at either extremity contained numerous lilac-coloured granules (Reich's corpuscles).

The right fourth dorsal posterior root ganglion was cut longitudinally, and the sections stained by Van Gieson's method. A large portion of the ganglion had been destroyed, and this area was occupied by fibrous tissue, some nerve fibres, and degenerated nerve cells. Many nerve cells had disappeared, and in those which remained there were no details of structure recognisable. In this sclerotic area there were no cells of reaction, but in the tissue immediately surrounding it there was a thick band of small cell infiltration. A similar type of exudation was evident in the layers of the ganglion capsule and around its vessels. Here and there, in the areolar tissue covering the capsule, in the capsule, and around the nerve cells, there were small hæmorrhages. In the

portion of the ganglion which was not destroyed there were many reaction cells which permeated the tissue between the nerve cells, and were in some situations heaped up into small isolated clusters.

The posterior root (right fourth dorsal) was cut longitudinally, and some sections were stained by Wolters - Kulschitzky's method; others by hæmatoxylin and eosin. About two-thirds of the medullated fibres were degenerated, and the nuclei of the corresponding neurilemma sheaths showed a high degree of proliferation.

The spinal cord was examined by Marchi's method alone. In the fourth dorsal segment the vessels were dilated and congested. There were small hæmorrhages in the grey matter. In the right root entry zone about two-thirds of the incoming posterior root was degenerated; the degeneration affected the collaterals passing into the grey matter, and also the descending branches of the root fibres. The latter could be followed downwards as far as the sixth dorsal segment. The degenerated root, when traced upwards, gradually decreased in volume, and at the level of the eighth cervical segment formed a narrow band lying against the paramedian septum. It was still recognisable in the third cervical segment where its most anterior portion lay against the median septum and the remainder along the paramedian septum.

In connection with the above series of cases, it does not seem out of place to mention the cord infection which sometimes follows inflammation of the urinary bladder. Walker (4) has recorded three instances of long-standing chronic cystitis which terminated fatally by acute ascending paralysis of a most malignant type. We have ourselves observed a case of transverse myelitis following chronic bladder trouble, the result of prostatic cancer. Leyden (5) has stated that in a considerable number of cases of so-called reflex paralysis, an anatomical affection of the cord has been proved, which begins as a circumscribed myelitis of the lumbar enlargement. He assumed that the infective agent first involved the nerves, in which it induced a progressive neuritis, and passed up to the cord. Another case of great interest is described by Collins and Armour (6). It was that of a boy in whom acute bulbar palsy followed an attack of mumps. The inflammatory changes in the medulla and pons were very intense and attained the maximum at the level of

the sixth nucleus, a fact highly suggestive of the spread of infection along the seventh nerve.

Six of the seven cases on which this communication is based show a diffuse meningo-myelitis of the cerebro-spinal axis, the direct result of, and anatomically continuous with, toxi-infective reaction phenomena of the peripheral nervous system. The condition, therefore, is one of meningo-myelitis secondary to ascending neuritis. In one of our cases, that of herpes zoster, the further spread of infection, which took origin in an empyema, was arrested at the posterior root ganglion, the destruction of which naturally resulted in a zone of degeneration in the posterior columns of the cord.

The inflammatory phenomena in the cerebro-spinal axis and its membranes vary considerably in intensity from case to case, according to the degree of potency of the infective agent; and the spread of the inflammation is by direct continuity, the mode of extension now recognised as typical of lymphogenous infections. Our cases show that any portion of the central nervous system may be attacked by organisms or toxins passing up the nerves from infective foci, and although the ultimate result of infection may vary according to the quality of the exciting cause, the anatomical path of entrance and spread is a constant one. For example, in cases 4 and 5 of tubercular infection of the central nervous system the meningo-myelitis has exactly the same distribution as in the other cases, but shows the distinctive quality of the exciting agent in the formation of giant cells.

It is important to recognise that where an area of infection exists outside the central nervous system and the latter shows no sign of functional or organic disturbance, still a variable degree of inflammation may be present in its substance and membranes (case 4). It is obvious, therefore, that absorption may take place along the ascending lymph paths of the nerves for a considerable period before the exciting agent is of sufficient potency to cause symptoms. And there is an anatomical reason for the attenuation of noxious agents as they approach the central nervous system. The highly vascular epidural tissue and the dura itself form a very efficient barrier to the inward spread of infection by the lymphogenous path and neutralise to a great extent the pathogenicity of organisms and toxins. Thus it is that in the early stages





PHOTO 12.—4th Dorsal Segment :  
White Matter near Periphery  
of Cord. Infiltration of Ad-  
ventitia of Vessel.

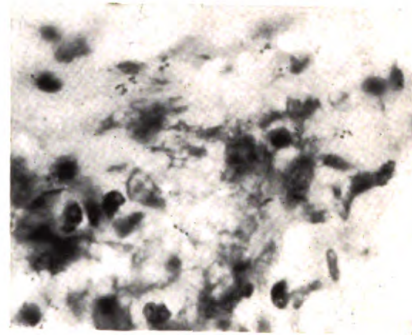


PHOTO 13.—High-power View of Photo 2,  
showing Micrococci.

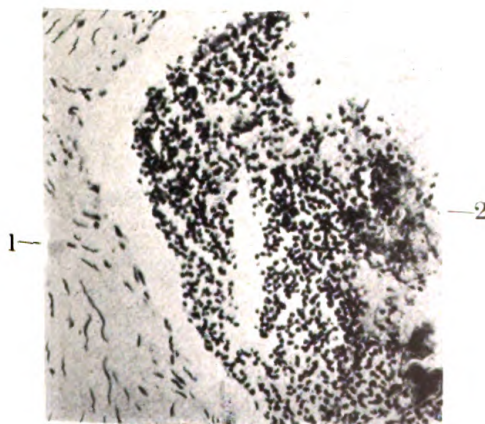


PHOTO 14.—4th Cervical Segment : Col-  
lection of Degenerate Polymorphs in  
Dilated Dural Space.

1, Dura Mater ; 2, Polymorphs.

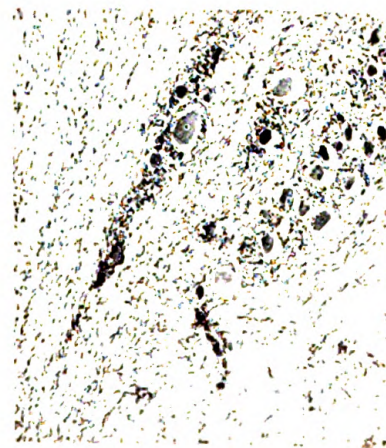


PHOTO 15.—Posterior Root Ganglion :  
4th Cervical. Showing increase of  
Capsular Nuclei round the Nerve  
Cells.



[illegible]

of infection the exciting agent reaches the cord in small quantities or in an attenuated condition and gives rise to almost inappreciable disturbance, but should the defence mechanism of the dura be broken down then acute inflammatory phenomena make their appearance. Cases 1 and 6 show how important a defence mechanism the dura is; one of the most striking features in their morbid anatomy is the marked diminution in the degree of inflammatory reaction amongst the tissues internal to the dura mater. A consideration of the above facts shows us, therefore, that in cases similar to those under discussion the post-mortem examination is not complete unless the cord and brain are investigated; for if neglected, many important and suggestive data may escape observation.

It has been shown by experimental infection of the lymph stream of the nerves and spinal cord that certain structures invariably showed the greatest degree of reaction, and the result of the examination of the above clinical cases coincides with our earlier observations. These structures are the loose areolar tissue covering the sheaths of nerves and the posterior root ganglia, the epidural tissue, and the adventitial elements of the veins and capillaries. The tissues furthest removed from the original toxic source suffer least of all, as do the structures protected by a fibrous sheath; hence the signs of ascending neuritis are less marked within the perineurium of the nerves and in the substance of the posterior root ganglia; while in the spinal cord, medulla, and pons, the degree of reaction diminishes from without inwards. That portion of the cerebro-spinal axis directly connected by nerves with the source of infection exhibits the highest degree of inflammation. Still the signs of meningitis may be very well marked both above and below the point of greatest intensity (case 6), but the gradual attenuation in potency of the infective agent is shown by the progressive diminution in the degree of myelitic phenomena. While, in the area of primary infection, adventitial inflammation, hæmorrhage, neuroglial hyperplasia, &c., are prominent, the only evidence of myelitis in distant parts may be confined to the presence of a few round cells in the adventitial spaces, and congestion of the vessels.

There are several additional observations in these clinical cases which agree entirely with the data derived from experiment. We again find that the adventitial elements proliferate readily

under stimulation and contribute largely to the inflammatory exudate. In acute inflammation the neuroglia nucleus and cell-body becomes swollen, and assumes an amoeboid appearance. There is an entire absence of thrombi, and only in one case in which the inflammatory process was extensive and acute was there any tendency to the local accumulation of leucocytes in the vessels.

With regard to the origin of the cell types which compose the exudate we have nothing to add to our last communication. The same structures react in our clinical cases as in an experimentally induced neuritis and meningo-myelitis; and the morphology of the reaction cells varies with the potency of the irritant. Many of the cell types are atypical, and the forms which they assume naturally vary according to the duration and intensity of the inflammatory process. The regressive changes which they undergo in many instances renders their strict classification well nigh impossible.

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## MULTIPLE NEUROMATA OF THE CENTRAL NERVOUS SYSTEM: THEIR STRUCTURE AND HISTOGENESIS.

By the late ALEXANDER BRUCE, M.D., LL.D., F.R.C.P.E.; and  
JAMES W. DAWSON, M.D. (Carnegie Research Fellow).

(Continued from page 315.)

### (3) GENESIS OF FIBRES IN TUMOUR FORMATION.

THE histogenesis of nerve fibres has been discussed from the developmental aspect and from the experimental aspect in the regeneration of the divided nerve, but it has very rarely been considered in pathological conditions. Here we have to do not with the first development of the embryonal nerve fibre, nor with the restoration of the distal end of a severed nerve, but with the new

formation of nerve fibres in a pathological tissue. Regarding tumours in relation to nerves, we have in general two opposite views: the one teaches that the tumours arise from the connective tissue and have only a local relation to the nerves; the other accentuates the nervous nature of the tumours.

Virchow, in 1863, as we have already seen, had emphasised the nervous nature of these growths, but his views did not gain general acceptance, and the conception continued to prevail that the tumours designated by the name "neuroma" arise from the connective tissue sheaths and have only a secondary relation to the nerves.

Von Recklinghausen, in 1882, noted the frequency of the relation of multiple neuromata with skin fibromata. He looked upon the tumours as essentially of the same structure—fibromata arising in the connective tissue sheaths of the nerves, especially the endoneurium; the difference lying in the difference of the site, the nerve trunks, and the fine cutaneous twigs respectively. Von Recklinghausen used the name "neurofibroma" as a compromise with the old-established term "neuroma," but he thought this terminologically incorrect, though it served to indicate the nature of the tumour (fibroma) and its relation to a nerve. After the appearance of Von Recklinghausen's work multiple tumours of the nerves were generally regarded as fibromata, and the existence of Virchow's supposed neuromata were more and more discredited, except by a few authors, amongst whom must be mentioned Knauss and Askanazy. These writers believed that many of the tumours described as neuromata, with numerous spindle-shaped nuclei, really contained non-medullated nerve fibres. They considered, however, that the presence of ganglion cells was essential to true neuroma formation, and ascribed the starting-point to the minute sympathetic ganglia and branches present in the vessel walls.

Alexis Thomson (1900) divided neuromata into true and false, basing this classification on the anatomical structure. Under true neuromata he identified only those tumours which contained ganglion cells, and he doubts whether true neuromata without ganglion cells can occur. Under the term false neuromata he classes: (1) All circumscribed or solitary tumours growing from the connective tissue of nerve trunks or of the ganglionic enlargements of nerves. They resemble similar tumours originating in other tissues and

organs, and are subdivided into innocent and malignant. (2) Traumatic neuroma. (3) Enlargements of nerves in leprosy, syphilis, and tuberculosis. (4) Diffuse overgrowths of the connective tissue sheaths of nerves, and of ganglionic enlargements of nerves, embracing a number of lesions affecting skin as well as the nervous system, and capable of assuming very different forms. French authors suggested the name "Von Recklinghausen's disease" for this group, and Thomson has given to it the general term "neurofibromatosis." It includes the following forms:—

(a) Multiple neurofibroma (generalised neurofibromatosis).—The endoneurial connective tissue between individual nerve fibres is the chief seat of the pathological process, and its increase may cause visible thickenings and tumours of the nerves with a dissociation and wavy course of the nerve fibres. The formation of new nerve fibres is "unlikely in the absence of nerve cells." In addition to the tumours of the nerve trunks, the terminal filaments of the nerves exhibit the same fibromatosis, so that the tissue of the true skin may be studded with innumerable minute tumours. The sympathetic system is frequently extensively involved, and the enlargement here also is stated to be due to an overgrowth of the delicate connective tissue which supports the nerve fibres and ganglion cells.

(b) Plexiform neurofibroma.—The pathological lesion here is essentially the same as in the more generalised form, except in its distribution and localisation: It is to be regarded as a fibromatosis confined to the distribution of one or more contiguous nerves or of a plexus of nerves. The nerve filaments in the pars reticularis of the cutis may also be irregularly thickened and studded with fibromatous nodules, in which the perineurium of the affected nerve bundles may, however, not be defined from the surrounding connective tissue.

(c) Cutaneous neurofibroma (*molluscum fibrosum*) are of the nature of soft fibroma related to the terminal filaments of cutaneous nerves, and may be distributed over the whole body.

(d) Elephantiasis neuromatosa.—In addition to the fibromatosis of cutaneous nerves there is here a pronounced and diffuse overgrowth of the connective tissue of the skin and subcutaneous tissue, *i.e.*, an extension of the fibromatosis from the endoneurial connective tissue of cutaneous nerves to the tissue surrounding them.

(e) Pigmentations of skin associated with neurofibromatosis.

(f) Secondary malignant sarcoma, *i.e.*, a sarcomatous transformation of one or other of the forms of neurofibromatosis.

Thomson presents neurofibromatosis as a disease which, while confined to the peripheral nervous system, may be distributed throughout its whole extent, *viz.*, the cerebro-spinal nerves, the sympathetic nerves, and the nerve terminations in the skin. These may be regarded as constituting one organ alike from developmental, structural, and functional points of view. He agrees with Goldman, Bruns, and others that the condition is a form of gigantism or elephantiasis of the connective tissue elements of the peripheral nervous system, and that it appears to be a developmental disease dating from intra-uterine life. Thomson significantly adds that a more accurate knowledge of the development of the peripheral nervous system may shed some light on the origin of neurofibromatosis.

During the past ten years careful research into the embryogenesis and regeneration of nerve fibres has given an altogether new view to the structure of tumours related to nerves, whether circumscribed or diffuse.

Durante (1906) has related this new view to his conception of the multicellular structure of the nerve fibres. According to it the tumours represent true neuromata, and owe their origin to a cellular regression of the segmental cells of the nerve fibre. The differentiated substance of the interannular segment of the nerve fibres disappears, and the undifferentiated vegetative protoplasm increases in quantity; and, with a simultaneous proliferation of the nuclei, forms homogeneous tubes or individualises into spindle-shaped cells. These cells may again fuse and form protoplasmic bands which have a great similarity to Remak's fibres, and must be looked upon as young nerve fibres. In proportion as they persist at the stage of undifferentiated protoplasm or differentiate further to elaborate myelin, they represent amyelinated or myelinated neuroma. If the new elements that have arisen through cellular regression remain as individual cells and proliferate further, then there arises an embryonal malignant form of neuroma, which in appearance resembles a sarcoma, and might be, in contrast to the others, termed a cellular neuroma. Again, the new-formed elements might undergo various metamorphoses, *e.g.*, atrophy, and take the appearance of connective tissue, or

imbibe mucin, or absorb fat; the tumours would then appear as fibromata, myxomata, or lipomata, respectively, but would remain in their nature essentially neuromata. In one and the same individual the tumours might appear under various forms. In all the various forms of neurofibromatosis the neoplastic element is the segmental cell which undergoes cellular regression. Neurofibromatosis, or Von Recklinghausen's disease, is a *polynévrome*, the elements of which for the most part undergo a fibrous transformation instead of differentiating themselves into young nerve fibres, or of remaining at the stage of cells of myelinogenous type.

Durante's conception of the nervous nature of these lesions is in direct contrast to Von Recklinghausen's conception of a progressive fibrosis beginning in the perineurium and evolving in the endoneurium. Thomson, while agreeing with Von Recklinghausen, has pointed out that the fibrillar tissue had no tendency to compress the nerve trunks, and was thus distinguished from other connective tissue new formations, *e.g.*, cirrhotic conditions. To numerous factors has been attributed a share in the pathogenesis, and nearly all writers have invoked a primary developmental malformation of the connective tissue elements related to nerves as the essential cause. Durante thinks that the exaggerated vegetative activity of the segmental cell must be due to an inherent instability in the differentiation of the nerve fibre, which renders it liable to be affected by determining causes.

(a) *Ganglio-Neuroma.*

The great majority of observations referring to ganglio-neuromata have related these tumours to the sympathetic nervous system. Their frequent occurrence in the medulla of the adrenal is explained by the generally accepted view of the invasion of the *anlage* of the cortex of the adrenal by "indifferent" cells of the sympathetic to form the medulla. In a few cases cranial nerves have been the starting-point of ganglio-neuroma.

Busse (1898) has described a very large diffuse ganglion-celled neuroma involving the entire abdominal portion of the sympathetic. Microscopic examination of the tumour proved the presence of large ganglion nerve cells similar to those found in the normal sympathetic ganglion, numerous non-medullated, and a few

medullated nerve fibres. Busse thought it probable that the tumour had arisen in the lumbo-sacral sympathetic cord, and on account of its diffuse character allied it to the plexiform tumours of spinal nerves.

Knauss (1898) records a case of very numerous ganglio-neuromata in the subcutaneous tissue of the thorax, abdomen, and thighs. The tumours were of very various size, and the microscopic investigation showed that all represented tumours of nerve tissue consisting of ganglion cells, medullated and non-medullated nerve fibres. The ganglion cells were found isolated and in groups embedded amongst the nerve fibres: the non-medullated fibres formed the great mass of the tumour, and the medullated fibres showed a weakly developed myelin sheath. Knauss thought the presence of the medullated fibres a confirmation of Virchow's statement that myelinated neuromata have a first non-myelinated stage. None of the non-medullated fibres could be traced to the ganglion cells, nor was there any visible connection with any filaments of cerebro-spinal nerves. He regarded the tumours as having arisen from the minute ganglia intercalated on the fine terminal fibres of the sympathetic system in relation to blood and lymph vessels. Knauss thought that a true neuroma without ganglion cells could not occur, though in this case he could trace no connection between the nerve fibres and the processes of the ganglion cells.

Beneke (1901) records two cases of ganglio-neuroma: the one related to the cervical sympathetic, the other to the semilunar ganglion. Microscopically the tumours consisted of a felt-work of nerve bundles with groups of ganglion cells between them. The cells had in general the character of sympathetic ganglion cells: some were very small with no processes, while others were large with very numerous processes. The neurite of many cells could be traced in direct continuity with the nerve fibres, and indeed a direct continuation of the cells of the capsule with the cells of the sheath of Schwann was frequently noted. The non-medullated character of the nerves was in proportion to the non-medullated constitution of a normal sympathetic ganglion, and the development of the nuclei was *pari passu* with the development of the nerve bundles. The question whether mature ganglion cells are capable of division cannot be answered affirmatively from Beneke's work, but he derives all the nerve



fibres from the ganglion cells of the tumour. The fact that the nerve fibres preponderate is explained by the division of one axis-cylinder into its primitive fibrils.

Oberndorfer (1907) describes a ganglio-neuroma in the medullary substance of the adrenal which contained groups of cells separated by septa of non-medullated nerve fibres and connective tissue. The cells were of all sizes, from that of a lymphocyte with all possible transitions to cells four or five times the size of ordinary sympathetic ganglion cells. Some of the cells, therefore, have the same morphological structure as the primitive cells from which both the sympathetic nervous system and the medulla of the adrenal develop. Ganglion cells were found in the meshes formed by interlacing naked axis-cylinders, and only in the marginal part of the tumour were there any axis-cylinders with sheaths of Schwann. The presence of medullated fibres could not be proved. The naked axis-cylinders with ganglion cells reminded Oberndorfer of an embryonic nerve tissue, *i.e.*, neuroblasts with their offshoots. He concluded that the smaller cells were the earlier forms of the ganglion cells, and thought it possible that in early embryonal life these had separated themselves, retaining their embryonic condition, till later some influence awakened their slumbering developmental possibilities, and they developed their morphological form of sympathetic ganglion cells. Oberndorfer believes that every true neuroma must be a ganglio-neuroma.

Falk (1907) describes a ganglio-neuroma whose origin was traced to the solar plexus. The essential constituents of the tumour were non-medullated fibres with interstitial connective tissue. The fibres were very delicate and undulating, with regularly situated, elongated nuclei along their course. Ganglion cells, isolated and in groups, were also found amongst the nerve bundles. The cells were of very various size and shape, mostly in various stages of degeneration, and all allowed to be recognised their derivation from one common parent cell. Axis-cylinder processes could be traced in only a very few ganglion cells: the great majority gave the impression of being a-polar cells. The author noted also the presence of small round or oval cells with metachromatic staining granules similar to the chromotrope cells found in the medulla of the adrenal and in the carotid gland.

The nerve fibres stained distinctly by Bielschowsky's method. Numerous sections were observed which contained only a few

ganglion cells, and nerve fibres formed the great mass of the tumour. In teased preparations the fibres showed clearly that the nuclei were within the nerve tube. Falk found it impossible to believe that this great mass of fibres was derived from the ganglion cells, which were not only mostly a-polar but degenerated. He therefore turned his attention to the possibility of the Schwann cells being the formative cells of the new nerve fibres: he found that these were present in great abundance, that the direction of their growth was parallel to the new axis-cylinder, and that within the cells a continuous plasmatic stripe, which later became the specifically staining axis-cylinder, was present. With Bielschowsky's silver method the axis-cylinders showed no differentiation into actual fibrils. Falk felt justified in coming to the conclusion that the new axis-cylinders had arisen by the differentiation of the protoplasm of the proliferated sheath of Schwann cells. He adds that with medullated sheath staining the axis-cylinders took on the myelin stain, and that if the sections were only slightly differentiated a weakly-staining myelin sheath was evident in the nerve tubes. The non-medullated character of the great majority of the fibres, therefore, does not seem quite proved. Falk thinks it possible that the degenerated ganglion cells constituted the chemiotropic influence which caused the marked proliferation of the nerve fibres.

Wegelin (1909) records a case of ganglio-neuroma at the level of the lower margin of the kidney. The cells again were of very varied size, the fibres again greatly preponderated, and numerous sections consisted exclusively of nerve fibres. These were collected into interlacing bundles to form a dense felt-work. In longitudinal sections the fibres appeared as bright undulating bands, with distinctly marked sheath and nucleus of Schwann. Most of the fibres were non-medullated and showed a dark thread in the centre corresponding to the axis-cylinder. The medullated fibres stained pinkish and showed numerous varicosities. In contrast to Falk's case, Wegelin found no proliferation of the sheath of Schwann cells, *i.e.*, no increase over the normal nuclei of the sympathetic fibres. He also found no spindle-shaped cells forming protoplasmic bands which could be looked upon as the early stages of non-medullated fibres. He thinks that the presence of the completely naked axis-cylinders, found by Beneke and Oberndorfer, argues against the possibility of the origin of the nerve

fibre from the sheath of Schwann cells. In both axis-cylinder and medullated sheath numerous degenerative phenomena could be ascertained, which showed a definite dependence upon the degree of degeneration of the ganglion cells. Wegelin, therefore, finds no reason to depart from the generally accepted view that the nerve fibres had arisen from the ganglion cells. He relates the starting-point of ganglio-neuroma to cell displacement in early embryonal life.

Homer Wright (1910) has drawn attention to a group of tumours which, at first sight, are apt to be mistaken for round-celled alveolar sarcomata. The tumour tissue consists of cells and fibrils. The cells have the same morphology as the cells from which the sympathetic nervous system develops: they are generally small, with round, deeply-staining nuclei and little cytoplasm, or they may be pyriform with the cytoplasm prolonged into filamentous processes. The fibrils are often of considerable length: they do not stain like neuroglia or connective tissue fibrils, and are like the fibrils occurring in the *anlage* of the sympathetic nervous system. The fibrils may be arranged in bundles, or ball-like formations of cells may occur, enclosing a mesh-work of fibrils and filamentous processes of the cells. The tumour tissue, therefore, presents the appearance of being composed of aggregations of more or less atypical embryonic sympathetic ganglia bound together by connective tissue stroma. The essential cells of the tumour are considered to be more or less undifferentiated nerve cells or neurocytes or neuroblasts, and hence the terms neurocytoma or neuroblastoma applied to the tumours. The occurrence in a variety of situations, and especially in the adrenal, is explained by the migration of undifferentiated nerve cells from the embryonic central nervous system to form the nerves and ganglia of the sympathetic nervous system.

(b) *Circumscribed Neuroma.*

Barile (1910) records the careful microscopic examination of an egg-shaped tumour of the forearm. At the operation the tumour, which was  $5 \times 4$  cm. in size, was found surrounded by a capsule, but at both poles seemed to have fibres of the radial nerve attached to it. The tumour consisted entirely of bundles of nerve fibres with scarcely any interstitial tissue, and was

without ganglion cells, therefore a true fibrillated neuroma. In the periphery of the tumour the bundles had a parallel course, but in the central parts the bundles interlaced in very varied directions. The fibres are only in part myelinated, and these are distinguished from normal adult fibres by their delicacy. They are found mixed with some that have an axis-cylinder and nucleus but no myelin sheath, and with others that correspond to the plasmodial bands of Durante, in which are present filaments that take the axis-cylinder stain. In addition, there are also fusiform cells, the elements from whose fusion in a chain a great part of the protoplasm bands are formed. There appear to be also fibres growing into the tumour from the radial nerve, that after a short course are modified in such a manner as to be transformed into elements similar to the above-mentioned protoplasmic bands. And, finally, there are present germ areas which seem to consist entirely of fusiform cells with elements a little further evolved.

Barile concluded that in this tumour were to be found all the various phases between the fusiform elements, from whose fusion protoplasm bands have arisen, to the complete nerve fibre which had arisen from the differentiation of these protoplasm bands. The fibres of the radial nerve have undergone cellular regression, and the individualised cells—from the proliferation of the nucleus of the sheath of Schwann—had again formed protoplasm bands which were found in a greater or lesser degree of differentiation from the formation of granular filaments to the constitution of the true axis-cylinder and myelin sheath. Here the new-formed fibres take their origin from a nerve that retains its normal connection with the centre.

*Traumatic Neuroma* must be included in this section. The bulbous enlargements which form in relation to the ends of a nerve that has been injured, or to nerves in a stump, have been proved to consist of a dense plexus of nerve fibres. The origin of these new fibres has been usually accepted to be from the dissociation of the old axis-cylinder into its primitive fibrils and their prolongation onwards. Kennedy, however, has shown that the young nerve fibres have arisen within the proliferated cells of the sheath of Schwann, and that they form interlacing bundles in the scar-tissue.

(c) *Neuro-Fibroma.*

Verocay (1910), in a long article, "Zur Kenntnis der Neuro-fibrome," discusses with very great detail the microscopic structure of multiple neurofibromata occurring in the same individual and the relation of these tumours to each other. After shortly referring to a previously published case in which he found multiple tumours of the cerebral and spinal dura, true gliomata of the cord, multiple neuromata of numerous cerebro-spinal nerves, and tumours of sympathetic nerves in the stomach wall, he passes to the description of a most remarkable case. In a man thirty-one years old, who was admitted to hospital with symptoms of cerebral tumour, and died one month after the operation for its removal, there were found multiple tumours on the inner surface of the cerebral dura of the nature of fibro-endotheliomata, small gliomata in the medulla oblongata and cord, tumours in both cerebello-pontine angles of the nature of very cellular neuro-fibromata, multiple tumours of the lumbo-sacral plexus, and finally, multiple tumours of peripheral nerves. It is to the last group that we wish to draw attention in this section. The relation of the groups to each other will be referred to later.

The microscopic structure of the multiple tumours of the nerves consisted of bundles of nerve fibres in the condition of protoplasmic nucleated bands, together with ganglion cells in various stages of development. Verocay starts from the assumption that ganglion cells and nerve-fibre cells (cells of Schwann's sheath) are derived in normal development from the same mother-cell (embryonal neurocytes of Kohn). He looks upon the ganglion cells as integral constituents of the tumour-development, and believes that they and the nerve fibre cells which have produced the nucleated bands have developed from the same undifferentiated cell. The undifferentiated nerve-fibre cells, he thinks, had proliferated greatly, and by their increase and differentiation nerve fibres were developed on the one hand and ganglion cells on the other. He thinks that the assumption of the pre-existence of ganglion cells in such cases is altogether unsatisfactory and unnecessary.

To Verocay the tissue of multiple neuro-fibromata, considered by most writers as a connective tissue, is a specific neurogenous tissue. Nerve fibre cells (peripheral neuroblasts) which have not

been used up in the normal construction of the nerve fibre are to be regarded as the parent cells of both ganglion cells and nerve fibre cells present in the tumour; he suggests the name "neurinoma" for tumours of this nature. Such tumours may undergo certain modifications, and to the term neurinoma might be added a qualifying word signifying the dominating elements, *e.g.*, neurinoma-gangliosum, -gliosum, -fibrosum, -sarcomatodes, &c. Verocay's views thus differ from those of previous writers on neuro-fibroma, who have regarded the developmental disturbance as affecting the connective tissue in nerves. It seems quite unintelligible to Verocay that only the connective tissue of the nerves is affected, when this in early development is in direct association with the other connective tissues of the body. He finds it much easier to believe that the primary disturbance lies in ectodermal elements, the connective tissue in relation to which may be secondarily affected.

Verocay has described the tumours in the cerebello-pontine angle as cellular neuro-fibromata. This agrees with the term "acoustic neuroma" frequently applied to some of these tumours. Froenkel and Hunt (1903) have also pointed out that histologically these tumours are neuro-fibromata, arising in relation to the intracranial portion of the cranial nerves. In advanced stages they may become sarcomatous, fibro-sarcomatous, or glio-sarcomatous. The glia elements may be explained by the fact that glia tissue accompanies the intracranial nerve trunks for a short distance, or, according to Verocay, who has investigated four such cases, the tumour formation relates to a developmental disturbance of the specific elements of the nerve tissue, affecting undifferentiated cells (neurocytes) which are capable of differentiating along three lines to form ganglion cells, glia cells, or nerve fibre cells.

#### NOTE ON GENESIS OF FIBRES IN TUMOURS OF THE CENTRAL NERVOUS SYSTEM.

##### (a) *Glioma and Neuro-glioma.*

Verocay (1910).—In the previous section we have seen that Verocay regards the early embryonal neurocytes as capable of differentiating to form ganglion cells, glia cells, and nerve fibre cells. From this it will be readily understood that the combination of glioma with multiple tumours of nerves found in both of

his cases is looked upon, not as an accidental occurrence, but is traced to the same developmental disturbance. He believes that when multiple tumours of nerves are more minutely investigated this combination will be found more frequently.

Schmincke (1910) has described a case of ganglio-neuroma of the brain in a man seventeen years old. The tumour was the size of a large nut, was situated in the anterior portion of the temporal lobe, and was not defined from the surrounding tissue. Microscopically, the tumour consisted of the several components of the nerve tissue, all in varying degrees of differentiation: (1) ganglion cells in different stages of development, distinctly recognisable as ganglion cells by their characteristic nucleus and general morphological structure; (2) numerous glia cells of various form and size and glia fibrils; (3) syncytial neuroblast chains consisting of fibres with inserted nuclei, showing a definite axis-cylinder but no myelin sheath, and therefore representing nerve fibres in different stages of development. Schmincke considers that the presence of these syncytial neuroblast layers may shed some light upon the development of fibres within the central nervous system. Schmincke holds that proof has been given in favour of the formation of the peripheral nerve fibres from neuroblast chains, but as yet no proof of a similar origin of the fibres within the central nervous system. For an explanation of this tumour Schmincke goes back to the detachment of a portion of embryonic nerve tissue, and believes that the embryonic neurocytes have differentiated along the three lines to form ganglion cells, glia cells, and nerve fibre cells. He suggests that the powers slumbering in this tissue have become active and have succeeded in completing their differentiation. Neuro-gliomata have thus the same origin as gliomata; there being no proliferation on the part of pre-existing ganglion cells, but all the cells of the tumour representing earlier or later stages of development of indifferent embryonic cells in which the process started. These cells are often far from any normal type.

(b) *Neuroma of the Central Nervous System.*

The literature referring to neuroma of the central nervous system is very scanty and scattered. Early findings of tumours consisting of nerve cells and medullated nerve fibres refer chiefly to small nodules on the surface of the ventricles in hydrocephalus.

As the microscopic technique was at the time very deficient, their value has been much discounted, and Courvoisier, in his monograph, "Die Neurome," 1886, makes no mention of them. Recent observations are almost entirely limited to neuromata of the spinal cord.

Raymond (1893), in a case of syringomyelia, found at different levels of the cord numerous small fasciculated nodules in the connective tissue septa of the posterior columns. The fine fibres composing these nodules had the structure of peripheral nerves and were grouped parallel to each other or intertwined. In addition to the central gliosis, there were present gliomata at various levels, forming diffuse and circumscribed infiltrations of the white matter. The posterior roots, which were healthy outside the cord, were interrupted in their intra-medullary course by these infiltrations, and in serial sections a direct connection could be traced between the entering posterior roots and the fibres composing the nodules. Raymond looked upon the nodules as neuromata of regeneration which had developed as a consequence of the interruption of the centripetal posterior roots by glia tumour tissue.

Schlesinger (1895) found similar nodules in two cases of syringomyelia and one such nodule in a case of tabes. In the tabetic cord the nodule was found in the upper cervical region and passed through only six successive serial sections. It was situated at the periphery of the cord lateral to the posterior horn, and was surrounded by a thin layer of dense glial tissue. The interlacing fibres of the nodule were thinner and stained less clearly than the fibres of the surrounding white matter. In the cases of syringomyelia several microscopic nodules were found in the central glious tissue: they were sharply contoured and composed of bundles of very fine fibres showing a spiral arrangement. Numerous elongated nuclei with their longitudinal axes parallel to the longitudinal axes of the fibrils were found in the nodules. Nowhere could any connection be traced with fibres of any of the columns of the cord or of the posterior roots, and in none of the nodules were any ganglion cells present. Schlesinger attributed the neuromata to a proliferative process, the result of a long-continued irritation. He came to this conclusion because the nodules were found always in a pathologically changed tissue with a chronic proliferation of the supporting elements.



Wagner (quoted by Schlesinger) produced neuromata experimentally in cats by dividing the anterior spinal roots. The neuromata always developed at the point where the anterior roots left the cord. In one case, where the roots were divided intra-medullarily, the nodules developed within the cord. Similar procedure at the posterior roots produced no neuroma.

Saxer (1896), in syringomyelia, found in the central gliosis numerous nerve fibres, isolated or in bundles, partly in the adventitia of vessels and partly free in the glious tissue. The fibres could be traced to the anterior longitudinal fissure and had the structure of peripheral nerves. In the obliterated central canal in the lumbo-sacral cord were numerous medullated nerves. Saxer ascribed the presence of these fibres to a regenerative process, but admits that he finds it impossible to explain how this had come about. Herveroch (1900), also in a case of syringomyelia, Bischofswerder (1901), in two similar cases, and Hauser (1901), in three, mention the finding in the central glious tissue of isolated nerve fibres or definite nodules composed of tortuous medullated fibres with the structure of peripheral nerves. In all of the above the nodules were often sharply delimited, and nowhere did the fibres of the periphery seem to be prolonged into the surrounding tissue. Bischofswerder draws attention to the frequent presence of vessels in the centre or at the periphery of nodules, and suggests that this fact may throw some light upon their origin.

Nageotte (1899), in tabes and in a case of hemisection of the cord, has found nerve fibres, isolated and in bundles, in all parts of the pia, but especially near the point of emergence of the anterior roots. Fickler (1900), in a case of compression of the cord, has found medullated fibres filling the anterior fissure from the adjoining pia. The significance of these findings of Nageotte and Fickler has already been referred to in the note on regeneration of fibres in the central nervous system.

Pick (1900) has described nodules composed of unstripped muscle fibres around the spinal cord vessels. Pick had previously, in 1895, described similar formations around the vessels of the pia, and had explained them as circumscribed proliferations of muscle fibres of otherwise normal vessels. Hellich later drew attention to the possibility of Pick's leio-myoma of the pia and cord being

true neuroma, which on account of their fascicular structure and elongated nuclei gave the appearance of leio-myoma.

Thomas, Touche, and Jacob (1901) described a case of Pott's disease following a fracture two years before death. The 8th cervical segment was compressed, and in the anterior fissure, immediately above the point of compression, were found very numerous nodules composed of fibres with the structure of peripheral nerves. Small neuromata composed of a few bundles of fibres were found also in the pia round the whole circumference of the cord at this level, and in the lateral column of the right side there was present a small nodule which at one point reached the pia. In none of the nodules could the origin of the fibres be traced, but the writers ascribe their formation without doubt to regenerative processes, and believe that the new fibres have their origin from the fibres of the tracts interrupted at the level of the compression. Dercum and Spiller (1901) have described non-myelinated fibres in the pia covering the posterior columns in a case of adiposis dolorosa. The posterior roots were not degenerated and the origin of the fibres could not be traced, but as there was an alteration in the columns of Goll the fibres in the pia might arise from a regenerative process in the posterior roots.

Helich (1902) has placed the whole question of neuroma of the cord in a new light. In six cases of different affections of the cord he found formations similar to those described by Raymond, Pick, and others. Nerve fibres with myelin sheath and sheath of Schwann could be traced in the adventitia of vessels from the periphery of the cord to the central canal vessels, whence they radiated into Clarke's column. Here and there the fibres develop into nodules which, under a low power, appear as leio-myomata. Helich considers that they must be looked upon not as tumour formations but as abnormal sensory centripetal nerves.

Rebizzi (1903), in a case of neuroma of the cord, found ganglion cells with abundant formation of new nerve fibres which could be traced to the ganglion cells. Rebizzi thought that a part of a nucleus of grey matter had been cut off in early foetal life.

Switalski (1903), in the cord of a patient with the clinical history of disseminated sclerosis, states that in addition to the degeneration of the fibre systems there were present numerous neuromata, especially in the lower dorsal and middle cervical segments. The nerve fibres composing these nodules were of

very varying thickness, often with varicosities: they had no sheath of Schwann, nor could an axis-cylinder be stained. Oval vesicular nuclei, which gave the nodules a very characteristic appearance, were always present. In the lower dorsal region the nodules were altogether in the grey matter and always in relation to blood vessels. In the cervical region the nodules were found in the posterior columns and in the pia, and often continued from the pia into the septa. In both regions they lay always in a completely normal tissue, and in spite of very exhaustive examination, Switalski could trace no connection of the fibres composing the nodules with fibres in the neighbourhood. He therefore sees no reason to think that these are neuromata of regeneration. He grouped together from literature eleven cases of true neuroma of the spinal cord, nine of which had appeared in syringomyelia, and thinks that this association of neuromata with syringomyelia points to the possibility of a developmental anomaly or disturbed development accounting for these formations.

Orzechowski (1908), in a case of malformation of the lateral recess of the 4th ventricle, together with tabes, found neuromata in the region of the central canal and in the pia of the cord from the 2nd lumbar segment downwards. The fibres which ran spirally round one another to form dense tufts had a delicate axis-cylinder, myelin sheath, and distinct neurilemma sheath and nucleus. In serial sections it could be proved that the pial fibres arise from the anterior nerve roots, for near the emerging anterior roots small bundles of fine fibres could be found passing into the adventitia of the pial vessels or free into pial spaces. The fibres could be traced to the base of the anterior fissure, and formed nodules in the region of the central canal. The distribution of the pial fibres coincides with the localisation of the posterior root affection in the lumbo-sacral region. Orzechowski considers that these aberrant root fibres represent a developmental anomaly.

Reich (1910) investigated eight tabetic cords, and found typical pial neuromata in three cases. Isolated fibres and bundles and nodules were found distributed through the thickened pia, chiefly of the lumbo-sacral cord. No distinction as to the origin of the fibres could be drawn between the isolated fibres, the bundles, and the nodules, and Reich confirms Orzechowski's observations that the fibres arise from anterior roots. He further states that the pial nerve bundles unite together and leave the pia laterally as nerve

trunks. He therefore regards them not as aberrant anterior root fibres, but as true anterior roots leaving the spinal cord in an atypical way. Both Orzechowski and Reich suggest that the frequent presence of medullated fibres in the pia in tabes represents one of the stigmata of the increased vulnerability of the tabetic cord.

In reviewing these findings of neuroma of the spinal cord it will be seen that all writers refer to microscopic nodules that lie in the grey or white matter or in the pia and its septa, that are perceptible in only a few successive sections, and that contain medullated nerve fibres with a sheath and nucleus of Schwann. The nerve fibres are finer than those of the surrounding tissue, and present numerous varicosities. Orzechowski has classified neuromata of the spinal cord into two groups. The one is related to a regeneration of fibres of the central nervous system. This origin of neuroma is probable where any lesion of the cord or roots is present, causing an interruption of the fibres, *e.g.*, Fickler's case (*spondylitis tuberculosa*), Wagner's experiments on cats, Nageotte's in hemisection of the cord and in tabes, Thomas, Touche, and Jacob's in Pott's disease, possibly also in the cases of syringomyelia of Raymond, Schlesinger, Saxer, Herveroch, Bischofswerder, and Hauser. The other group includes those cases in which there was no fibre interruption, and consequently could be looked upon not as a reparatory process but as abnormally placed nerve fibres. This interpretation was the more plausible as there were frequently present other malformations. To this category belong Switalski's case in which the neuromata were accompanied by aplasia of the cerebellum, the cases of pial neuromata which must be regarded as aberrant or abnormally placed nerve fibres, and to this group also more probably belong the neuromata found in syringomyelia. Orzechowski thinks that to the neuromata described by Hellich as abnormally placed centripetal tracks an independent position may be ascribed on account of their functional character.

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It is a pleasure to record the great debt we owe to Dr James Ritchie, the Superintendent of the Laboratory. His wise guidance

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We are indebted also to Dr David Orr of Manchester, Dr Rows of Lancaster, Dr Harvey Pirie, and Dr Ninian Bruce for much kindness, help, and criticism.

The illustrations in the text are by Dr Ninian Bruce, the coloured illustrations by Mr Richard Muir, and the photographs by Mr William Watson and Mr Muir: our thanks are due to them for the great care with which these have been prepared.

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## Abstracts

### ANATOMY.

**THE EYE-MUSCLE NERVES IN NECTURUS.** PAUL S. MCKIBBEN, (313) *Journ. of Comp. Neurol.*, 1913, xxiii., June 15, p. 153 (8 figs).

A STUDY of twenty-five adult specimens of *Necturus maculosus* by the *Intra vitam*, methylene blue method (a slight modification of J. Gordon Wilson's technique). The optic apparatus shows poor development compared with that of some other *Urodeles*. The eye-muscle nerves are all present, but are very small, the abducens being

the smallest. The oculomotorius showed sometimes certain peculiarities of distribution. The trochlearis varies greatly, even in an individual specimen, on the two sides of the head; its root usually contains sixteen to twenty-four fibres; about four to eight of these "seem to enter the nerve uncrossed." These direct fibres are larger than the other trochlearis fibres, and seem to "belong to the mesencephalic root of the trigeminus." In addition, "two or three smaller fibres from the tectum have been observed which appear to enter the trochlear nerve uncrossed." Once the right trochlearis joined the oculomotorius; their fibres were so intermingled that they could not be separated; the superior oblique muscle was supplied by the dorsal ramus of the oculomotorius, "presumably by trochlear fibres." "No group of cells corresponding to the ciliary ganglion has been found, but there are quite constantly present twigs from the ramus ophthalmicus profundus trigemini, the oculomotor, and the abducent nerves, which enter the bulbar fascia and the eye-ball. These twigs most often apply themselves to the sheath of the optic nerve."

LEONARD J. KIDD.

**THE INNERVATION OF THE DIGESTIVE TUBE.** ALBERT KUNTZ,  
(314) *Journ. of Comp. Neurol.*, 1913, xxiii., June 15, p. 173 (5 figs.).

A VALUABLE histological study based primarily on preparations of stomach and intestine of cat and dog: failure by Cajal's and Bielschowsky's methods: in cat the *Intra vitam*, methylene blue method sometimes answered: the pyridine-silver method, as used by Ranson, was very useful, but less uniformly good than in other parts of the sympathetic system. Author's summary is as follows: 1. The ganglia of the myenteric plexus are interposed between the longitudinal and circular muscular layers of the digestive tube. The ganglia of the submucous plexus are imbedded in the submucous layer. The ganglia of each of these plexuses are variously connected by commissures of non-medullated fibres, among which may be traced both axons and dendrites. 2. These two plexuses are interconnected by fibrous commissures. Nerve fibres also extend from the submucous plexus into proximity with the digestive glands, where many of them terminate on gland-cells, and into the gastric folds and plicæ and the intestinal villi, where many of them terminate on cells of the digestive epithelium. The fibres which end on the latter are doubtless the dendrites of "receptive" or sensory neurones. 3. The orientation of the neurones in the ganglia of the myenteric and submucous plexuses, and the distribution of their axons and dendrites, strongly suggest that the sympathetic system, like the other functional divisions of

the nervous system, is essentially a system of reflex arcs involving both sensory and motor neurones, some of which are strictly local while others are less local or even involve centres in the cerebro-spinal nervous system. 4. The normal nervous control of the digestive functions is probably exercised primarily by the local sympathetic mechanism, the general control which is exercised by extrinsic nerves being largely tonic in character. The major part of such tonic control is probably exercised by the vagi.

LEONARD J. KIDD.

### PHYSIOLOGY.

**EXPERIMENTAL STUDIES ON THE NERVOUS MECHANISM**  
(315) **IN THE PRODUCTION OF HYPERPLASIA.** WALTER TIMME,  
*Journ. Nerv. and Ment. Dis.*, 1913, xl., May, p. 311.

ACTING upon the supposition that the nerve impulses produced by metabolism travel in certain circuits, the stomach with its nerve supply both from the vagus and sympathetic seemed to offer excellent conditions for experimental work. It was assumed that if, without disturbing too much the motility and function of the stomach, the nerve current produced by the activity of the gastric cells could be made to flow in diminished volume *via* the vagus, the excessive remainder must travel by the sympathetic. If this is so, the control exercised by the sympathetic system over the *trophic* functions of the gastric cells, *e.g.*, growth, reproduction, repair, is stimulated.

The author has tried to determine the truth or falsity of the above inference. Cats were the animals used for this experimental work. Both the right and left vagus were ligated below the oesophageal plexus, and following this, as controlled by normal cats, an actual cell increase in the mucous membrane of the stomach occurred. The trophic control over the gastric cells—growth and reproduction—was excessively stimulated; the control of their functional activity, and that of the stomach as a whole—the production of the gastric juice, the expulsion of the contents from stomach to intestine—was greatly in abeyance.

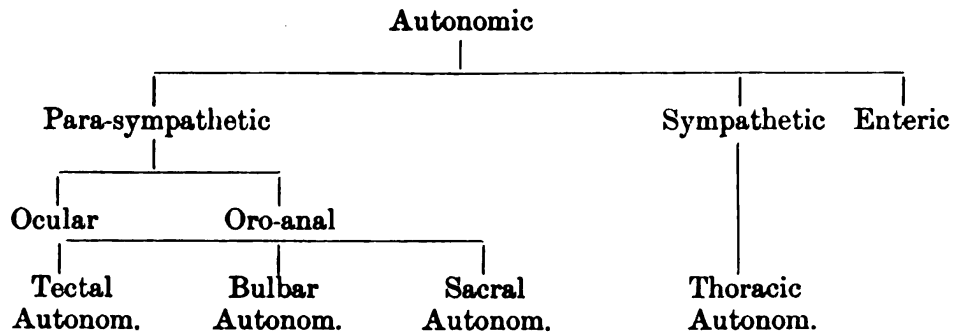
The supposition, therefore, of the nerve current passing in the circuit of the sympathetic in increased quantity as a result of partial closure of the vagus path is held as being supported by the results of these experiments.

D. K. HENDERSON.



**THE NOMENCLATURE OF THE SYMPATHETIC AND OF  
(316) THE RELATED SYMPTOMS OF NERVES.** J. V. LANGLEY,  
*Zentralbl. f. Physiol.*, 1913, xxvii., p. 149.

The following nomenclature is suggested :—



A few remarks on these terms are then offered.

A. NINIAN BRUCE.

### PATHOLOGY.

**THE ENDOGENOUS FIBRES OF THE HUMAN SPINAL CORD  
(317) (FROM THE EXAMINATION OF ACUTE POLIOMYELITIS).**  
F. E. BATTEN and GORDON HOLMES, *Brain*, 1913, xxxv., p. 259.

As a result of the examination by the Marchi method of the brain and spinal cord in three cases of acute poliomyelitis in children, the authors draw the following conclusions :—

(1) The spinal portion of the spinal accessory nerve has a large intramedullary root which extends throughout the upper five or six cervical segments of the spinal cord.

(2) The longer descending systems of the dorsal columns—Schultze's comma tract, Hoche's marginal bundle, Flechsig's oval field, and Gombault and Philippe's triangle—do not contain endogenous fibres in man.

(3) The propriospinal fibres of the ventrolateral columns are arranged in man as in other mammals, and conform in their arrangement to the law that the longer fibres lie nearer the surface of the cord.

(4) Many fibres of the ventrolateral columns ascend to the brain-stem and terminate in the inferior olives, in the formatio reticularis bulbæ et pontis, in the nucleus centralis inferior, and probably in the nuclei laterales of the medulla; others ascend in the dorsal longitudinal bundles as high as the midbrain.

A. NINIAN BRUCE.

**THE PATHOLOGY OF CHRONIC PROGRESSIVE CHOREA.** J. A. F.  
(318) PFEIFFER, *Brain*, 1913, xxxv., p. 276.

CHRONIC progressive chorea is a curious affection which occurs comparatively late in life, and is characterised by irregular movements, disturbance of speech, and an accompanying psychical derangement, terminating gradually in dementia. Homogeneous heredity is not always present, although of frequent occurrence. It is at present disputed whether the disease is a clinical entity distinct from Sydenham's chorea or a variety of it.

The clinical history and post-mortem findings of two cases are given here. In both the smallness of the brain and spinal cord was marked. Diffuse degenerative changes in the nerve-elements of the brain were found most severe in the optic thalamus, corpus striatum, and in the frontal, pre- and post-central regions. The Betz cells were well preserved. The ganglion cells showed acute changes, but more commonly sclerotic changes, with great increase of lipoid pigment. The neuroglia showed an enormous increase of glia cells and glia fibres, especially in the lower layers of the cortex, the corpora striata, and thalami. A deficiency of the tangential and oblique fibres of the cortex was noticeable. The most obvious pathological alterations in the vessels were found in the lenticulate nuclei and thalami, the lumen being often nearly obliterated. A great many amyloid bodies were seen in the cord, thalami, and lenticulate nuclei.

In conclusion, the pathology consists not only of the degenerative process in the nervous elements of the cortex, but of the thalamus and corpus striatum.

A. NINIAN BRUCE.

**A STUDY OF THE BRAIN IN A CASE OF CATATONIC**  
(319) HIRNTOD. SAMUEL T. ORTON, *Amer. Journ. Insanity*, 1913,  
lxix., April, p. 669.

A CASE of a psychosis of acute onset followed by death within fifteen days, and showing at autopsy neither gross nor microscopical visceral change of sufficient intensity to be regarded as factors in the disease or causes of death. Clinically the diagnosis is not definite on account of the short time of observation and the condition of the patient, but the limited data place it probably as a case of dementia præcox of the catatonic form. Sections stained with thionin and by the Bielchowsky method yielded findings which might be the result of post-mortem disintegration, but which in the case of the thionin specimens at least were probably ante mortem in occurrence. In specimens stained by the Herxheimer and osmic acid methods considerable amounts of

lipoid materials were found in the ganglion cells, glia cells, and phagocytic cells of the perivascular spaces. By Alzheimer's methods IV. and VI., amœboid glia cells with a variety of granules were found widely scattered throughout the brain in the lower layers of the cortex and particularly in the subcortical white matter.

A. NINIAN BRUCE.

**THE EXPERIMENTAL PRODUCTION OF PELLAGRA IN THE (320) MONKEY OF A BERKEFELD FILTRATE FROM HUMAN LESIONS—A PRELIMINARY NOTE.** WM. H. HARRIS, *Journ. Amer. Med. Assoc.*, 1913, lxx., June 14, p. 1948.

THE inability to produce satisfactorily pellagra in animals by means of various foodstuffs (spoiled maize, &c.), led to the following investigations based on the hypophysis that pellagra is caused by a living micro-organism and not by a chemical irritant.

Three monkeys were experimented upon, and were injected with tissue from fatal human cases. The animals developed all the essential clinical signs and symptoms, together with the pathologic picture discerned in the disease in man. The author suggests that the etiology of pellagra is a filterable virus or a micro-organism capable of passing through the pores of certain Berkefeld filters.

A. NINIAN BRUCE.

## CLINICAL NEUROLOGY.

**THE ACCURACY OF LOCALISATION OF TOUCH STIMULI ON (321) DIFFERENT BODILY SEGMENTS.** SHEPHERD IVORY FRANZ, *Psychol. Review*, 1913, xx., March.

AN account of a series of tests, carefully carried out, dealing with the localisation of touch stimuli on different bodily segments.

The skin was stimulated by means of a camel-hair brush, and the subject was instructed to locate the point by touching the skin as close as possible to the stimulated spot. The subjects used were accustomed to observations and examinations of the different parts of the body. They were artists' models, women who had been engaged in that capacity from one to ten years.

It was found that the average error of localisation of light touch varied in different parts of the body, the most accurate localisation being found for the face; the succeeding order being:

foot, chest, fore-arm, abdomen, upper leg, upper arm, lower leg, back.

The accuracy of localisation of light touch stimuli was greater than that of more intense stimuli.

The average error was less than the double point threshold, but these bore no constant relation to each other.

There appeared to be no constant relation between the average lengths of the body hairs and localisation error.

Stimuli to a part were sometimes localised on an opposing part, *e.g.*, near the axilla there were localisations on the chest when the arm was stimulated.

J. STANLEY HOPWOOD.

**NOTE ON A CASE OF AMYOTONIA CONGENITA.** (*Myatonia* (322) *Congenita* of Oppenheim.) [Six Illustr.] DENIS COTTERILL, *Edin. Med. Journ.*, 1913, x., p. 519.

THE patient was a girl, aged 2½, and was brought to the surgical wards of the R. I. E. on account of a club foot. The child is the youngest of a perfectly healthy family of three or four. Parturition easy, no instrumentation. Immediately after birth the child was noticed to be abnormally flaccid, and was on this account quite difficult to hold. Child was unable to suck either from breast or bottle, and was fed by having milk poured into its mouth. No difficulty in swallowing. Crowing noise on breathing, which continued till child was some months old.

On admission the patient was found to be well grown, fairly well nourished, but rather pale and "flabby" looking. Facies is dull and immobile; drooping of upper eyelids; mouth constantly kept open. Mentally the child is distinctly backward, and is of a most "peevish" disposition. No evidences of rickets, myxoedema, or abnormality of thyroid. Skin, though pale, is not mottled or cold. Head normal in shape and ossification. No squint.

*Typical features of Amyotonia seen in this case.*—Congenital origin. Hypotonicity of muscles generally. Lower limbs more affected than upper. No definite muscular atrophy. Abnormal mobility of all joints. Practically normal electrical reactions. No reaction of degeneration. Loss of patellar, Achilles, and superficial reflexes. Sensation little if at all affected. Improvement in condition slow but definite.

*Features in this case only occasionally noted in other cases of Amyotonia.*—Involvement of facial muscles. Difficulty in sucking. Noisy breathing. Athetoid movements of hands. Presence of kypho-scoliosis. Presence of certain muscular contractures and club foot. Hyperextension of fungus. Slight genu-recurvation.

*Features in this case not known to have previously occurred in a case of Amyotonia.*—Dislocation and malformation of right hip joint. Congenital genu-recurvation, with small patella and backward dislocation of femur. Position of thumb (extreme flexion) with partial dislocation. Definite congenital origin and unilateral distribution of certain contractures and club foot. Umbilical hernia, weakness of upper part of abdomen in mid line, and abnormal condition of lower part of sternum (simulating a "funnel" chest). Considerable power shown at times, especially in certain muscles, as result of an intense mental effort.

The article is preceded by a short survey of the previously published cases.

AUTHOR'S ABSTRACT.

**TABES AND SALVARSAN.** (*Tabes et Salvarsan.*) DR BOUCHÉ, (323) *Journ. de Neurol.*, 1913, xviii., April 5.

AN account of a few cases of tabes which have been treated with salvarsan. A series of five injections were given, and many of the symptoms of the disease were relieved after one or two injections. In some cases the patient relapsed, and it was necessary to give a second series of five injections. Patients who, owing to ataxia, had been unable to walk, were enabled to do so after treatment. The pains were diminished, and in one case incontinence was relieved. Knee jerks, which were absent or sluggish before treatment, became normal, but the action of the pupil to light appears to have been unaffected.

The author considers that these cases show the value of arsenical treatment in certain tabetic symptoms, and the significance of symptoms of radicular irritation in the early diagnosis of the disease.

J. STANLEY HOPWOOD.

**A CASE OF SPINAL TUMOUR WITH SCOLIOSIS; OPERATION.**

(324) WILFRED HARRIS and A. S. BLUNDELL BANKART, *Lancet*, 1913, clxxxiv., June 21, p. 1730.

THE patient was a woman, aged 57, who began to suffer from weakness and aching in the back seven years ago. On examination a dorsal curvature of the spine was found and she was ordered a poroplastic jacket; but a year later weakness in the legs developed, so that she was unable to get about without assistance, and ultimately had to remain in bed. The paralysis was accompanied by girdle-pain round the lower part of the chest and by loss of sensation in the lower extremities. Owing to the presence of the spinal deformity, arthritic disease of the spine, causing pressure on the cord, had been diagnosed, and operation refused;

but later, as the symptoms pointed clearly to pressure on the cord, laminectomy was performed, and the fourth and fifth dorsal spines and laminae removed. A soft pinkish tumour was then discovered and removed at the level of the sixth dorsal vertebra. It was about the size of a pigeon's egg, and was found to be a psammoma.

Recovery was uninterrupted, and the patient can now walk without assistance.

Scoliosis has not before been described in association with spinal tumour. In this case the growth of the tumour was very slow (seven years), and its situation corresponded exactly with the upper limit of demonstrable anaesthesia. A. NINIAN BRUCE.

#### **MIRROR WRITING AND OTHER ASSOCIATED MOVEMENTS**

(325) **OCCURRING WITHOUT PALSY.** C. W. BURR and C. B. CROW, *Journ. Nerv. and Ment. Dis.*, 1913, xl, May, p. 300.

A MAN, 27 years old, whose hands at birth seemed to be useless, and in whom it was noticed later that any movement in either hand was accompanied by movement of the other. He could not learn a trade on account of the fact that each hand did or tried to do whatever he was doing with the other. When 25 years old it was discovered when given two pencils and told to write with both hands that the left hand wrote mirror writing.

Mirror writing is said by the authors to be the natural and physiological way for right-handed persons to write with the left hand. D. K. HENDERSON.

#### **A STUDY OF THE FLACCID SPINAL PARALYSIS WHICH**

(326) **ATTACKED LOUIS PASTEUR IN EARLY MATURITY, AND ITS SIMILARITY TO AN ATTACK OF ACUTE EPIDEMIC POLIOMYELITIS. TOGETHER WITH A STUDY OF THE SILKWORM AS A POSSIBLE MEDIARY HOST OF THE SAME DISEASE.** J. VAN VLIET MANNING, *Med. Record*, 1913, i., p. 976.

AN interesting paper in which the writer attempts to prove that the attack of left hemiplegia which Pasteur had at the age of 46 was due to acute poliomyelitis, and not to cerebral hæmorrhage as diagnosed by contemporary physicians. The acute febrile onset, agonising pain in the arm, complete absence of coma, flaccid paralysis and foot-drop, were all in favour of the former disease. At the time of his attack Pasteur was engaged in the study of the silkworm epidemic, and Manning suggests that the silkworm was a host of the unknown organism of poliomyelitis.

J. D. ROLLESTON.

**A CASE OF LANDRY'S PARALYSIS, WITH ESPECIAL REFERENCE TO THE ANATOMICAL CHANGES.** J. A. F. PFEIFFER, *Brain*, 1913, xxxv., Part iv., p. 293.

THE case of a man, aged 24, who on rising one morning noticed he had difficulty in walking. This increased until he could not stand without support. Paralysis of the arms followed, then of the shoulder and neck muscles, and death took place shortly from respiratory paralysis. The Wassermann reaction was negative both in the blood and in the cerebro-spinal fluid.

Microscopically the brain, membranes, and spinal cord appeared practically normal. A streptococcus was isolated from the spleen. The motor cells were well preserved throughout the central nervous system, the cellular changes which were present not having any direct relation to the paralysis. On examining the peripheral nerves, an interstitial neuritis was found, although there were no sensory symptoms and no pain on pressure.

A. NINIAN BRUCE.

**THE ABORTED FORMS AND PRE-PARALYTIC STAGE OF ACUTE POLIOMYELITIS IN THE BUFFALO EPIDEMIC.** (328) E. A. SHARP, *Journ. Nerv. and Ment. Dis.*, 1913, xl., May, p. 289.

THE epidemic of poliomyelitis which was prevalent in Buffalo during the past summer and autumn was more extensive than any of the previous epidemics in Western New York. Altogether up until 1st November 1912, 310 cases with 41 deaths had been reported to the Health Department in Buffalo. These cases were classified into three groups: (1) Suspicious, (2) Aborted, and (3) Paralytic.

Cases were considered suspicious if they presented only constitutional symptoms of a general nature without any local nervous symptoms; aborted cases were those which showed some involvement of the nervous system along with the general symptoms, but no definite paralysis; and the paralytic cases were those in which there was either a definite paralysis or a prolonged weakness of muscles.

Out of 180 cases 29 were seen in a stage before the paralysis developed, or which remained aborted. The results of the examination in these cases are tabulated, and referred to in a detailed way. All grades of transition were found to occur from the mildest gastro-intestinal or simple febrile disturbances to the severe paralytic and rapidly advancing fatal cases.

D. K. HENDERSON.

**REPORT OF A CASE OF PNEUMOCOCCUS MENINGITIS WITH  
(329) NORMAL CEREBRO-SPINAL FLUID.** J. M. BRADY, *Journ.  
Amer. Med. Assoc.*, 1913, lx., p. 972.

A FATAL case in a male infant aged 1 year. The necropsy showed broncho-pneumonia and pneumococcus meningitis of the convexity. The normal cerebro-spinal fluid was due not to the shutting off of the spinal canal, but to absence of liquefaction in the thick and tenacious exudation covering the brain. Reference is made to the paper of Oseki, who recorded four cases of clinically latent meningitis in pneumonia, the condition being first discovered microscopically post mortem (*v. Review*, 1912, x., p. 387).

J. D. ROLLESTON.

**ON A CASE OF PNEUMOCOCCAL MENINGITIS.** (Notas clinicas  
(330) con motivo de un caso de meningitis pneumocócica.) F. R. G.  
FORNOS, *Policlínica*, 1913, i., p. 249.

A RECORD of a case of pneumococcal meningitis of the convexity in a woman, aged 30, following directly on a typical attack of lobar pneumonia. Three intra-spinal injections of Merck's anti-pneumococcal serum were given, and recovery took place, but a condition of mental deficiency resulted, and was unaffected by injections of fibrolysin.

J. D. ROLLESTON.

**A FRESH CASE OF PARAMENINGOCOCCUS SEPTICÆMIA WITH  
(331) RECURRING MENINGEAL ATTACKS.** (Un nouveau cas de  
septicémie à paraméninocoques avec épisodes méningés à  
répétition.) OETTINGER, P. L. MARIE, and BARON, *Bull. et mém.  
Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 935.

A MAN, aged 24, who had previously had malaria, was suddenly seized with violent and almost daily attacks of intermittent fever, accompanied by enlargement of the spleen. Quinine had no effect, and within a month meningeal symptoms developed. These were purely spinal in character, and consisted in very severe lumbosacral rachialgia and considerable stiffness of the lower limbs. The parameningococcus was found in the blood and spinal fluid. Under treatment with specific serum the meningitis, which resisted antimeningococcus serum, cleared up, but the septicæmia persisted, and a fresh attack of meningitis occurred which was jugulated in a few days by larger doses of serum. A fortnight later there was a third attack of meningitis, which also yielded to serum treatment.

Finally, after three and a half months of parameningococcus septicæmia, complete recovery took place. (*Cf. Review*, 1911, ix., p. 205.)

J. D. ROLLESTON.



**ON ACUTE, MILD, EPIDEMIC MENINGITIS** (Contribution (332) à l'étude des méningites aiguës, bénignes, épidémiques.)  
J. CHATAIGNON, *Thèses de Paris*, 1912-13, No. 252.

A CERTAIN number of cases of acute cerebro-spinal meningitis, whose cytological formula resembles that of tuberculous meningitis, though the fluid is sterile, should be classified with the nervous infections due to the unknown agent of acute poliomyelitis (medullo-virus). The diagnosis is sometimes confirmed by the occurrence of paralysis or paresis.

The thesis contains the histories of eight original cases in children aged from a few months to nine years.

J. D. ROLLESTON.

**HÆMORRHAGIC TUBERCULOUS MENINGITIS IN A BABY.**  
(333) (Un cas de méningite tuberculeuse hémorragique chez un poupon.)  
C. FAIRISE and A. REMY (Nancy). *Rev. méd. de l'Est*, 1913, xlv., p. 384.

A MALE infant, aged 5½ months, was admitted to hospital on 10th September for frequent convulsions, most marked on the right side. Lumbar puncture gave issue to a pink fluid under hyper-tension. Some improvement followed mercurial treatment which was given on account of prominent veins in the temporal regions and perineal erosions. On 13th September the convulsions ceased, and there was paresis of the left lower limb. Lumbar puncture gave issue to a very hæmorrhagic fluid. Death from convulsions occurred on the 16th. Post mortem general miliary tuberculosis was found. Histological examination revealed small hæmorrhagic foci in the pia mater, and its prolongations into the brain substance almost universally in the neighbourhood of the vessels, most of which showed inflammation of their inner coat. An abundant leucocyte infiltration was found round many of them, and invading their walls.

The hæmorrhagic form of tuberculous meningitis is probably due to secondary infections—the present case had intestinal troubles—which affect both the blood and the vessels. In some cases syphilis, inherited or acquired, may explain the vascular fragility, which is certainly not due to tuberculous infection alone.

J. D. ROLLESTON

**ACCIDENTS FOLLOWING THE SUBDURAL INJECTION OF THE**  
(334) **ANTIMENINGITIS SERUM.** SIMON FLEXNER, *Journ. Amer. Med. Assoc.*, 1913, lx., June 21, p. 1937.

THE reduction in mortality caused by epidemic meningitis and brought about by the serum is from two-thirds to three-fourths

of the average percentages occurring among patients not subjected to the specific treatment.

The cases reported by Kramer (*v. Review*, 1913, xi., p. 332) and others, where sudden death followed the administration of the serum subdurally, appear to be the result of excessive intracranial pressure and not to anaphylactic shock. It is quite certain it is not due to the phenol preservative. No other effective means of treatment are known, and thus it is not justifiable to withhold the remedy on account of some small risk in view of the far greater danger of the disease itself.

A. NINIAN BRUCE.

**THE FIFTH CEREBRAL VENTRICLE.** (*Le (cinquième ventricule) (335) cérébral.*) DE LEY, *Journ. de Neurol.*, 1913, xviii., April.

A DESCRIPTION, with photograph, of a definite fifth cerebral ventricle in a patient who died of meningo-encephalitis. The other cerebral ventricles were practically normal.

J. STANLEY HOPWOOD.

**A CASE OF TYPHOID SPONDYLITIS.** (*Sur un cas de spondylite (336) typhique.*) FAVRE and BOVIER, *Lyon Méd.*, 1913, cxx., p. 777.

A CASE remarkable for the age of the patient—a woman of 60—and the rapid evolution of the vertebral inflammation. The spondylitis lasted only one and a half months. Improvement was sudden, and the pains disappeared in a few days without special treatment.

No X-ray examination nor lumbar puncture was made.

J. D. ROLLESTON.

**THE DISSEMINATION OF DIPHTHERIA IN THE HEART (337) BLOOD AND ORGANS.** (*Die Verbreitung der Diphtherie im Herzblut und in den Organen.*) P. SOMMERFELD, *Arch. f. Kinderheilk.*, 1913; *Bagusky Festschrift*, p. 698.

THE neurological interest of the paper lies in the following figures: in 58 cases fluid from the ventricles or spinal canal was examined post mortem. In 13 cases (22·4 per cent.) diphtheria bacilli were found associated with cocci, in 14 (24·1 per cent.) there were cocci only, and in 31 (53·5 per cent.) no organisms were present. Of 28 cases in which the medulla was examined, diphtheria bacilli associated with cocci were found in 2, cocci only in 2, and in the rest there were neither diphtheria bacilli nor cocci, but sometimes *B. coli* and *Proteus*. (*Cf. Review*, 1912, x., p. 292.)

J. D. ROLLESTON.

**DIPHTHERITIC PARALYSIS.** J. D. ROLLESTON, *Arch. of Ped.*, 1913, (338) xxx., p. 335.

THE paper is based on 2,300 personal cases of diphtheria observed by the writer in the course of the last 10 years. 477, or 20·7 per cent., showed some form of paralysis; 184 were severe, and 85 were fatal. The direct relation between the initial angina and the subsequent paralysis is shown by the fact that the percentage of paralysis cases after very severe angina was 70·8; after severe, 46·5; after moderately severe, 23·6; after moderate, 13·6; after mild, 2·5; and after very mild, 0. Of 30 cases of purely nasal diphtheria only 1 had any paralysis. No paralysis occurred in 20 cases of purely laryngeal diphtheria. Paralysis was more frequent (42·1 per cent.) in cases in which there was nasal involvement than in those in which the fauces only, or together with the larynx, were affected (14·1 per cent.). Loss of tendon jerks and the presence of Babinski's sign (*v. Review*, 1910, viii., p. 404) were also more frequent after severe attacks.

Palatal palsy occurred in 331 cases, cycloplegia in 236, squint in 80, cardiac paralysis in 80, paraplegia in 36, pharyngeal paralysis in 36, and diaphragmatic paralysis in 16. Of the 85 fatal cases, in only 5 did the paralysis start after the end of the second week, death in these 5 cases being due to paralysis of the diaphragm. In the rest death was due to cardiac paralysis, the first sign of which had arisen before the beginning of the third week.

The untoward significance of precocious paralysis of the palate (*v. Review*, 1906, iv., v., 608) is shown by a percentage mortality of 35·2 among 141 cases in which it was found, as compared with a percentage mortality of 1·5 among 190 cases in which it first occurred after the end of the first fortnight. Other prognostic signs are described and the treatment discussed.

AUTHOR'S ABSTRACT.

**A LECTURE ON MINERS' NYSTAGMUS.** T. LISTER LLEWELLYN, (339) *Brit. Med. Journ.*, 1913, June 28, p. 1359.

A GENERAL account of this condition. It was first described in Belgium in 1861. Two views are held in regard to its causation: one, that it is due to the position assumed by the miner at his work, and the other that it is due to deficient illumination. There are two varieties of the disease. In the first the symptoms are absent or latent, and the man is unaware of his nystagmus. In the second the man is unable to work, and aware that his eyes are affected. The first symptom is failure of sight; next, the lamps dazzle the eyes, then headache, giddiness, and photophobia. The physical signs are involuntary and irregular movements of the

eyeballs, chiefly rotatory, tremor of the eyelids, eyebrows, and head. The cause is, that owing to the deficient light of the mine the images formed in the eyes are indefinite and inexact; this leads to indecision on the part of the controlling mechanism in the brain, so that irregular inco-ordinate movements of the eyeballs ensue. The mean age was 39.8 years. Reference is also made to several other points.

A. NINIAN BRUCE.

**CONGENITAL DEFICIENCY IN THE CRANIAL VAULT.** F. (340) LANGMEAD, *Proc. Roy. Soc. Med.*, 1913, vi. (Sect. Study Dis. Child.), p. 151.

LANGMEAD showed a boy aged 4 years, with a pulsating area, the size of a threepenny piece, at the posterior part of the inter-parietal suture.

J. D. ROLLESTON.

**EXTIRPATION OF THE VESTIBULE OF THE LABYRINTH WITH**  
(341) **CEREBELLAR ABSCESS. OPERATION; FURTHER A NEW REFLEX PHENOMENON.** (Extirpation des vestibulären Labyrinthes mit Kleinhirnabszess. Operation; ferner ein neues Reflexphänomen.) RITCHER, *Ztschr. f. Ohrenheilk*, 1912, lxvi., S. 94.

FEMALE, aged 26. Left ear discharging since childhood. On admission old left facial paralysis and ptosis. Nystagmus to diseased side. Some left abducens paralysis. Head bent back and to left. Pain on moving it. Much headache, worse posteriorly, vomiting, giddiness. Patient cannot stand or walk. Radical operation same day. Next day canals and vestibule removed, dura of posterior fossa, in which was a small fistula oozing pus, opened, and an extraordinary large cerebellar abscess evacuated. Abscess drained at first by a tracheal canula No. 4. Recovery.

Hearing apparently remained in the left ear. Among others the following method of testing employed.

A stethoscope with a celluloid membrane over the end and two ear tubes is employed. The ear tubes are connected to the patient's ears. A vibrating tuning fork is stood on the celluloid membrane. When the noise, which is great, strikes the ear the patient blinks. The right tube here was pinched close. Even then the patient blinked, with the right eye, of course, ptosis being present in the left. Tested in a dark room, with the left ear she could distinguish the quantity of sounds, but not their direction or distance. The author then discusses the possibility of the semicircular canals, in addition to their other function, having to do with sound localisation, the vestibule with the distance of sounds.

R. VÉREL.

**CEREBELLAR TUMOUR.** MAX MAILHOUSE and W. F. VERDI, *Journ. (342) Nerv. and Ment. Dis.*, 1913, xl, May, p. 303.

THE description of the case of a gliomatosis cerebellar tumour occurring in a girl 15 years, which was successfully operated on and removed. The patient has made a good recovery.

D. K. HENDERSON.

**THE END RESULTS IN SIXTY-THREE CASES OF OPERATION (343) FOR BRAIN TUMOUR.** WILLIAM J. TAYLOR, *Annals of Surgery*, 1912, lvi., p. 55.

LOOKED at from a surgical point of view the author divides tumours of the brain into three groups: (1) Those which cannot be localised with any degree of accuracy, and when the skull is opened cannot be found. (2) A small percentage of cases when at operation the tumour is found, but cannot possibly be removed. (3) A very small number of cases when the tumour can be readily located and completely or partially removed.

Six were tumours of the dura, and all of these came under the group of class No. 3. The operative results of these were successful, one patient living for twenty years after operation, the other three cases died of recurrent hæmorrhage within a few hours of operation.

There were eight simple cysts of the brain substance, four cerebral and four cerebellar; six recovered from the operation of simple drainage, one five and a half years after operation being still alive. There were seven cases of brain tumours, gliomata and indotheliomata, so localised that their complete removal was possible.

In group No. 2 there were nine cases, the infiltrating character of the tumours preventing their complete removal.

In thirty-three instances the tumours could not be found at operation.

The operation mortality was exceedingly high: six patients died within the first five days, thirteen died from the sixth to the tenth day: nineteen deaths all told within ten days of operation (30 per cent.).

The final results were exceedingly bad: one case of dural tumour lived for twenty years after the operation, a cyst of the cerebellum is alive and well five and a half years after operation, a glioma of the cerebrum is alive three years after operation but a recurrence has appeared.

While the operation results as regards removal of the tumour are exceedingly disappointing, the author draws attention to the enormous benefit which results from a decompressive operation; it relieves the intense headache and papilla oedema, and if undertaken sufficiently early it undoubtedly materially prolongs life.

J. FRASER.

**REPORT OF A CASE OF A LARGE ENDOTHELIOMA OF THE**  
(344) **FRONTAL REGION OF THE BRAIN.** R. L. WHITNEY, *Amer.*  
*Journ. Insanity*, 1913, lxi., April, p. 705.

THE patient was a man, aged 45. He was a highly intellectual boy, becoming leader of an orchestra at the age of fourteen, and was specially proficient in original composition and transposition. Fifteen years ago he suffered from a nervous breakdown, resulting in retirement from an active professional life. Subsequently there occurred periods of lethargy, depression, and loss of ambition, with final incapacity for self-support. Beginning with a transitory period of unconsciousness, various neuro-muscular disturbances were apparent which were followed by apathy, somnolence, and progressive mental deterioration, which symptom, complex in the absence of thorough neurological examinations, led to the diagnosis of general paralysis.

At the autopsy a large endothelioma of the frontal region of the brain was discovered, located chiefly in the right frontal lobe, but also extending into the left frontal lobe. It was apparently of slow growth.

A. NINIAN BRUCE.

**DIFFUSE GLIOMA OF THE PIA MATER.** ALBERT M. BARRETT,  
(345) *Amer. Journ. Insanity*, 1913, lxi., April, p. 643.

THE material was obtained from a man who died at the age of 40, after four months' vague mental symptoms. A large glioma was found growing in the subependymal substance in the right occipito-temporal lobe. It had invaded the adjacent pia mater, and spread widely through the pia of the greater part of the brain, cerebellum, cranial nerves, pons, medulla, and upper part of spinal cord. In its extension it had pushed in among the fibres of the pia mater, and in places lay in the subarachnoid space. From the spaces of the pia, glia cells had invaded the lymph spaces of the adventitia of the blood vessels, and extended deeply into the substance of the brain, and in places these had broken through the vessel walls and formed focal metastases in the perivascular area.

References to eighteen other cases are given.

A. NINIAN BRUCE.

**NEW FORMATION OF NERVE CELLS IN AN ISOLATED PART**  
(346) **OF NERVOUS PORTION OF THE HYPOPHYSIS-TUMOUR IN**  
**A CASE OF ACROMEGALY WITH DIABETES, WITH**  
**DISCUSSION OF THE HYPOPHYSIS-TUMOURS FOUND SO**  
**FAR.** ADOLF MEYER, *Amer. Journ. Insanity*, 1913, lxi., April,  
p. 653.

THIS case is one of typical acromegaly, in a woman aged 52, of six years' duration, associated with panansic disposition and

adenoma-like tumour of the hypophysis of a hyperplastic-progressive character.

The conclusions are that the changes in the hypophysis in acromegaly seem to be more uniform than the descriptive terms in the literature would suggest. The differences of opinion may be due in part to a limitation of the examination to one or few portions of the tumour. In a sequestered part of the nervous portion, unmistakable new formation of nerve cells with Nissl bodies had occurred besides other monstrosities.

A. NINIAN BRUCE.

**ACROMEGALY; DIABETES; PITUITARY TUMOUR.** (Acromégalie, diabète, tumeur hypophysaire). CARNOT, RATHERY, and J. DUMONT, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 921.

A WOMAN, aged 58, was admitted to hospital for diabetes of three years' duration. Typical acromegaly was also present, and had existed for many years. The diabetic symptoms suddenly became more severe, and death took place within a month of admission. Post mortem no macroscopical lesion was found to explain the sudden termination. In addition to epithelioma of the hypophysis, changes were found in all the glands of internal secretion, especially hæmorrhages and sclerosis in the suprarenals, sclerosis and hypertrophy of the thyroid, and marked hyperplasia of the parathyroids.

J. D. ROLLESTON.

**DISEASES OF THE LABYRINTH CAUSED BY SUPPURATIVE (348) MIDDLE EAR INFLAMMATION (COMPLICATIONS, DIAGNOSIS, TREATMENT).** (Die durch suppurative Mittelohrentzündungen verursachten Labyrinthkrankheiten. Komplikationen, Diagnose, und Behandlung.) V. UCHERMANN, *Ztschr. f. Ohrenheilk.*, 1912, lxi., S. 49.

COMPLICATIONS; most frequent meningitis; usually the infection spreads by way of the internal auditory meatus. Less common are deep extradural abscess on the posterior surface of the pars petrosa and brain abscess. The spread of infection here usually by dehiscences of the labyrinthine wall, fistula, or ductus endolymphaticus. Brain abscess of labyrinthine origin is very rare. The author distinguishes between a toxic serous meningitis, "meningo-encephalitis," and a bacterial serous meningitis, which is an early stage of purulent meningitis. The diagnosis of meningitis is discussed at some length, stress laid on lumbar puncture. As a rule, cloudy bacteria containing spinal fluid is a sign of meningitis, but proves nothing as to the stage or depth of the illness. In the diagnosing of abscess, which is usually

cerebellar, the direction of the nystagmus and Bárány's pointing reactions are of importance, as also the fact that in cerebellar ataxia the direction of falling bears no relation to the direction of the nystagmus and position of the head, in contradistinction to vestibular ataxia. The treatment is discussed fully both of suppurative labyrinthitis and its complications. R. VÉREL.

**THE PASSING OF PARASYPHILIS.** S. POLLITZER, *Med. Record*, (349) 1913, i., p. 797.

In specimens of two hundred cases of general paralysis—many of them poorly stained sections only—Noguchi found *Spirochaeta pallida* in forty-eight. With improved staining, the frequency of spirochaetes in paresis will probably be found to be greater.

Noguchi's discovery proves that "paresis is not an indirect effect of syphilis but is a disseminated spirillosis of the brain, is syphilis itself." The great majority of the cases had been of comparatively short duration, and if further studies show that the organism is absent from prolonged cases, the view will be confirmed that the nervous system is an unfavourable soil for the growth of bacteria.

Pollitzer thinks that similar findings will soon be made in tabes, especially in cases of short duration, in which death has been due to an intercurrent affection. J. D. ROLLESTON.

**THE CUTANEOUS REACTION IN SYPHILIS (SECOND REPORT).**

(350) JULIAN MAST WOLFSOHN, *Journ. Amer. Med. Assoc.*, 1913, lx., June 14, p. 1855.

The author considers that the luetin reaction for syphilis is specific when properly performed. Intensive antisyphilitic treatment in the later stages of syphilis may produce a negative luetin reaction which, after an interval in which treatment is withdrawn, may become positive. Treated congenital and secondary syphilis is apt to give positive luetin reactions. The luetin reaction is especially valuable in parasyphilis, and tertiary and latent syphilis. In any case of suspected syphilis, whether previously treated or not, a negative luetin reaction must be watched for at least four weeks, so as not to overlook a delayed reaction. A. NINIAN BRUCE.

**CASE OF EXOPHTHALMIC GOITRE CURED BY X-RAY.** S. TOUSEY, (351) *Med. Record*, 1913, i., p. 849.

A CASE of Graves' disease with moderate exophthalmos and marked cardiac palpitation and tremor in a woman aged 32. X-rays and high frequency currents from a vacuum electrode were



applied over the thyroid gland three times a week. Arsenic and strychnine were the only drugs given, and only for a short time. Recovery took place in three months, and no recurrence has taken place in the course of over seven years, although within a year of the treatment the patient was subjected to great anxiety owing to the illness of her child.

J. D. ROLLESTON.

## PSYCHIATRY.

### **PRESENCE OF THE TREPONEMA PALLIDUM IN THE BRAINS**

(352) **OF THREE GENERAL PARALYTICS.** (*Présence du Treponema pallidum dans trois cerveaux de paralytiques généraux.*) A. MARIE, C. LEVADITI, and J. BANKOWSKI, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxv., p. 881.

THE brains of forty-five general paralytics from Marie's service at Villejuif were examined, and positive results were found in two, in one of whom the disease had lasted seven years, while in the other its course had been more rapid. In the third case, in which the progress had also been rapid, numerous spirochætes were found in the frontal cortex.

Fontana-Tribondeau's silver method was used.

J. D. ROLLESTON.

### **DELIRIUM TREMENS AND CRANIAL TRAUMATISM.**

(353) **tremens et traumatisme craniën.** DR LEY, *Journ. de Neurol.*, 1913, xviii., April 5.

A CASE of severe cranial injury, the symptoms of which were entirely masked by the presence of delirium tremens. The patient, a chronic alcoholic, fell from his horse, knocking his head against a wall. The following day he developed the classical symptoms of delirium tremens. The tendon reflexes were abolished in the lower limbs and exaggerated in the upper. The cutaneous reflexes were normal except the abdominal, which were absent. Sensibility was diminished, and there was generalised analgesia. The pupils reacted normally, and continued to do so until death.

On the seventh day after the accident the patient developed convulsions of the left side, with contracture of the right arm. The convulsions increased in frequency, the temperature rose, and the patient died on the eleventh day after the injury.

Post-mortem examination revealed the presence of a fracture of the skull extending from the right parietal bone to the tip of the petrous portion of the temporal bone. Large blood clots were present in the right temporo-sphenoidal fossa, and in both

frontal fossas. The external table of the parietal bone was fractured, but the fracture did not extend to the inner table.

The severe delirious symptoms and the toxico-traumatic origin of the mental state masked the local signs, and the convulsions, which bore a resemblance to Jacksonian epilepsy, were attributed to the delirium.

J. STANLEY HOPWOOD.

**CONTRIBUTION TO ALZHEIMER'S DISEASE.** (Nuovo Contributo (354) per la "Malattia di Alzheimer.") ALBERTO ZIVERI, *Rassegna di Studi Psichiat.*, 1913, iii., p. 187.

THE case of a woman, aged 53, who suffered from progressive mental weakness as shown by loss of memory, confusion, disorder, excitement, and pronounced disturbance of speech. She died three and a half years later in coma. There had been no previous illness.

Later senile plaques were found scattered throughout the whole of the cerebral cortex, with the characteristic alteration of the neurofibrils described by Alzheimer. No special localised lesion was found. The author considers that Alzheimer's disease is a clinical and histological entity.

Some remarks on the senile plaques follow, and on the presence of argentophil granules in the nerve cells, which the author thinks is independent of the changes in the neurofibrils.

A. NINIAN BRUCE.

**A SERIES OF NORMAL-LOOKING BRAINS IN PSYCHOPATHIC (355) SUBJECTS.** E. E. SOUTHARD, *Amer. Journ. Insanity*, 1913, lxi., April, p. 689.

THE main object of this communication is to stimulate interest in normal or normal-looking brains in psychopathic subjects, so that the question whether insanity is, or is not, always a matter of structural brain-disease may approach settlement. Normal-looking brains have now been found in a large fraction of senile dementia cases in two autopsy series, so that the "functionality" of these cases stands on as good a footing as that of various more generally recognised "diseases of mental function." The issue in dementia præcox is now clearly defined, since one series (Worcester) might be interpreted to affirm the functionality, and the other (Danvers) to affirm the structurality ("organic nature") of the disease in question. Incidentally the question has arisen whether dementia præcox may not, on the ground of viability, be divided into *dementia præcox brevis* (with early death, say, under two years from onset) (katatonic form often here found) and *dementia præcox longa* (death usually after eight years). It is hardly possible from gross appearances to be able to assert abnormality of brains

unless at least three months have elapsed from the onset of some cell-destructive process. Various nerve cells also, which are in all respects intrinsically normal, may be essentially sharing in processes extrinsically abnormal, and the whole cortex may be intrinsically normal, but extrinsically abnormal, in its reactions to a given chemical, physical, or other condition. It seems clear that the general statement, "*insanity in brain disease*," is well-nigh meaningless unless the particular structures thought to be involved are specified.

A. NINIAN BRUCE.

## Reviews.

**LE LIQUIDE CÉPHALO - RACHIDIEN, NORMAL ET PATHO-**  
 (356) **LOGIQUE, VALEUR CLINIQUE DE L'EXAMEN CHIMIQUE**  
 By W. MESTREZAT. A. Maloine, Paris, 1912. Pp. 681. Pr. Fr. 12.

THE examination of the cerebro-spinal fluid has at last been put on a scientific basis by this admirable work, to such a degree that all future work on this fluid must take Mestrezat's book as a starting point.

During the last few years much attention has been directed to the cerebro-spinal fluid, and the cytology and albumen content have been the subjects of much valuable work; but this has been largely spoiled by inexact methods of technique, and by conclusions drawn from insufficient data. The present work is free from both these errors. The methods of examination employed, although for the most part of extreme simplicity, are of great accuracy, and the long tables of figures which intersperse the book free the reader's mind of any suspicion of dogmatism. In addition, the quantitative examination of chlorides and sugar has been carried out in most instances, and the freezing point, alkalinity, total ash, urea, &c., have also been the subjects of thorough investigation. Choline, anti-bodies, and other supposed properties of the cerebro-spinal fluid have also been sought, for the most part in vain.

As the book deals almost entirely with the chemical aspect of the fluid, the cytological formula is usually dismissed very briefly. The physiology of the production of the cerebro-spinal fluid (by dialysis through the epithelium of the choroid plexus), and of its circulation and absorption, are the only parts of the work to which any objection of dogmatism could be raised. But it is necessary for the author to put forward certain hypotheses for the explana-

tion of the various conditions of the fluid, and those given seem to be justified by the reaction of the fluid to varying factors.

Any doubtful statements made in the work are explained by the author's attention to the chemistry of the fluid rather than to the clinical aspect of the disease. For instance, he asserts that tubercular meningitis (with the presence of bacilli in the fluid) is of necessity fatal; a statement which is not upheld by recent experience. Such a statement is, however, outside the main object of the work, and is more than counterbalanced by the formulæ given by which tubercular meningitis may be diagnosed by the chemical examination of the cerebro-spinal fluid alone.

Especially interesting are the chapters dealing with the syndrome of "massive coagulation and xanthochromia" of Froin; with uræmia and the chloride retention of Bright's disease; with diabetes, fevers, and general intoxications.

It is interesting to note that although in cases of hydrocephalus and cerebral tumours the author has found, or quoted from the literature, estimation of albumen as high as any in the syndrome of Froin, and associated frequently with yellow coloration and the presence of fibrin, yet he has not suggested any co-relation or similarity in the mode of production in these various conditions. The suggestion offers that in each case this condition of the fluid is due to the same cause, *i.e.*, a shutting off of the dialysed ventricular fluid from the general circulation, thus allowing the more albuminous contributions from the neural sheaths, pial vessels, &c., to accumulate. This hypothesis, however, needs to be verified by further work along the lines of full chemical examination suggested by the author's work.

The book closes with an exhaustive bibliography of forty-three pages.

The comprehensive nature of the volume renders it valuable, not only to neurologists, but to all who use laboratory methods in the investigation of their cases.

J. GODWIN GREENFIELD.

**OUTLINES OF PSYCHIATRY.** W. A. WHITE. Nervous and Mental (357) Disease Monograph Series, No. 14. New York, 1913. Pr. \$3.00.

THIS work is one of the volumes edited by Drs Smith Ely Jelliffe and Wm. A. White in their Nervous and Mental Disease Monograph series. A consideration of the subjects treated in certain other volumes of the series tends to strengthen the preliminary reflection that a work upon the general outlines of so extensive and varied a subject as psychiatry is somewhat out of place in a series of monographs. Paranoia, hysteria, epidemic poliomyelitis, and cerebellar functions are subjects well suited for such a series,

but it may well be doubted if the suitability extends to the subject indicated by the title of this book.

The work extends to a little over 300 pages, and is divided into twenty-one chapters. The first two of these, headed "Psychological Introduction" and "The Nature of Mental Disorder," extend to fourteen pages, and give early evidence of the somewhat sketchy and incomplete nature of much of the book. It is difficult to see what else could be the case. The psychological terms mentioned in Chapter I. would, in themselves, provide ample material for an exhaustive monograph.

Chapters III. and IV. on "Classification and Causes of Mental Disease," and Chapter V. on "Treatment," are brief and didactic. We are glad to note the strong recommendation of hyoscyamus, given hypodermically, in conditions of acute excitement, but cannot agree with the author that in tube feeding the oesophageal route is always to be preferred, and miss any mention of saline rectal injections as a method of hydrotherapy.

Chapter VI. deals with "General Symptomatology," and is one of the more comprehensive and informative parts of the book. The paragraphs upon illusion, hallucinations, disorientation, delusion, negativism, stupor, &c., if abbreviated, are concise and to the point. The same, however, cannot be said of the section headed "The Complex," which takes much for granted, and is unconvincing.

The chapter on paranoia and paranoid states is of interest from the large number of authors whose views are quoted, but we miss any reference to Tanzi upon this subject, and generally throughout the book the Italian alienists receive little recognition.

Chapter IX., upon "General Paralysis," gives a description of the disease on the usual 1st, 2nd, and 3rd stage lines, but touches very lightly upon the problems of etiology. No reference is made to the views of Ford Robertson, and the numerous workers who have put forward views in support or refutation of his opinions.

The discussion of "Dementia Præcox" is interesting and suggestive, and stress is laid upon the views of Bleuler and Stransky in regard to schizophrenia and intrapsychic ataxia. We note with some alarm, however, the description of no less than five varieties of the disease. The stenogram illustrative of hebephrenia is extremely good and characteristic.

Chapters XI. and XII. deal with involutional melancholia and the senile or præ-senile psychoses. The author does not seem to us to distinguish clearly between involutional and climacteric melancholia. We are glad to note the recommendation of alcohol, alone or in combination with a hypnotic, in cases of senile insomnia.

Chapter XIV., on the toxic psychoses, deals with alcohol, opium,

cocaine, and other exogenous poisons. It is surely by mistake that cirrhotic liver is mentioned so prominently under the head of "Pathology of the Alcoholic Psychoses" (p. 211). Mott's view in a contrary sense is quoted on p. 196.

Livingston's solution is recommended for chronic alcoholism, and the prescription given in a footnote, but the author confuses the directions he gives for its administration by the contradictory use of equivalent terms. The outline of D.T. is good.

In Chapter XV. epilepsy is dismissed in four and a half pages, and its treatment in three lines, and in the following chapter the thyroid psychoses receive only half a page. We cite these instances to show how cursory and brief are the references to some important forms of mental disease.

Chapter XIX., upon "Principles and Methods of Examination," is the longest in the book, and presents a most exhaustive scheme of examination, with a degree of detail that seems excessive in a volume of outlines.

Chapter XX., giving a scheme of minimum mental examination, is more practicable, and is fully sufficient for ordinary work.

Chapter XXI. deals with the Binet-Simon tests for determining the psychological age of the child. The tests are given as modified to suit American children, and would probably require further modification for use in this country.

We have read this book with a sense of disappointment, for it seems to us to fulfil the functions neither of a manual for the student nor of a treatise for the specialist.

T. C. MACKENZIE.

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## Notice of Meeting.

A MEETING of the International League against Epilepsy will be held in the House of the Royal Society of Medicine, 1 Wimpole Street, London, W., at 10 A.M. on Wednesday, 13th August.

The programme will include the discussion of the Reports of the National Committees of the League and other papers.

By the kind invitation of the managing committees of the Institutions, two visits have been arranged; the first on Wednesday afternoon, 13th August, to the London County Council Epileptic Colony at Epsom, Surrey; and the second to the David Lewis Epileptic Colony, Sandle Bridge, near Alderley Lodge, on Thursday, 14th August.

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Zalla, Mario. "Contributo allo studio dei nervi periferici nella paralisi progressiva, nelle pellagra e nelle demenze senili." Firenze, 1913.

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*Fifty-fifth Annual Report of the General Board of Commissioners in Lunacy for Scotland.* Edinburgh, 1913.

# **Review**

of

# **Neurology and Psychiatry**

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## **Original Articles**

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### **CLINICO-PATHOLOGICAL FINDINGS IN SYPHILIS OF THE CENTRAL NERVOUS SYSTEM.<sup>1</sup>**

By WILLIAM H. HOUGH, M.D.,

Clinical Pathologist, Government Hospital for the Insane, Washington, D.C.

QUESTIONS which frequently confront the psychiatrist and neurologist are—Has the patient syphilis? If so, does the disease affect the central nervous system? And has the patient syphilis or so-called parasyphilis?

These questions cannot be answered in a high percentage of cases without the assistance of the clinical pathologist. In a small percentage of cases it remains for the histopathologist to decide the questions, and occasionally even this last resort leaves us without a definite answer. Not only are some of our best histologists unable to differentiate in rare instances between paresis and tertiary syphilis, likewise tabes and lues spinalis, but sometimes unable to decide between syphilis and some non-syphilitic conditions. However, I believe when our cases are thoroughly examined by modern methods that we are enabled to make a correct ante-mortem diagnosis in 98 per cent. of the cases of general paralysis and about 85 per cent. of our cases of syphilis of the nervous system.

While there are a great many laboratory tests recommended as aids to the diagnosis of parasyphilis and syphilis of the nervous system, the following are of the most practical utility at the

<sup>1</sup> Read before the Society for Nervous and Mental Diseases of Washington, D.C., at a Symposium on Syphilis of the Central Nervous System, 20th March, 1913.



present time, namely: The estimation of the protein content of the cerebro-spinal fluid; the cell estimation of the cerebro-spinal fluid; the Wassermann reaction with the cerebro-spinal fluid; the Wassermann reaction with the blood serum. In this connection should be mentioned also the luetin cutaneous reaction of Noguchi, for although its use is rather limited at present in neurological and psychiatric practice it is of great value, under certain circumstances. The same may be said of the provocative Wassermann reaction.

The more delicate chemical analyses of the spinal fluid and blood, the cytology of the blood, the estimation of the ferments of the spinal fluid, the quantitative Wassermann reaction, animal inoculation, &c., are of interest, and may prove to be of some value, but *at present* their practical use is quite limited.

The work done thus far along this line by the writer includes the examination of 650 specimens of spinal fluid and 3,000 Wassermann reactions including 225 cases of general paralysis and 100 cases of syphilis of the nervous system. As a general rule, it is not difficult to determine whether or not a case belongs in the syphilis-parasyphilis group, but difficulty often arises in differentiating syphilis from parasyphilis. Granting that parasyphilis may be but another stage of syphilis, the fact remains that it is exceedingly important for treatment and prognosis for us to differentiate between these two conditions.

*Considering the Several Tests individually.*—First, the Wassermann reaction with the blood serum. On a complete positive Wassermann reaction with the blood serum we may conclude as a rule that the patient has syphilis. The conditions other than syphilis, in which a complete positive reaction is found, are rare, and are generally such that the question of differential diagnosis seldom arises. Naturally it does not necessarily follow because a case shows a positive Wassermann reaction with the blood serum that the disease of the nervous system with which he may be suffering is of a syphilitic nature. I have found four cases reported (in the literature) in which a mistaken diagnosis of a syphilitic disease of the nervous system was made on account of a positive Wassermann reaction. We should not be surprised to find, for example, a non-syphilitic tumour occasionally in a syphilitic, the same as we find in them dementia præcox, tuberculosis, &c.

In paresis approximately 98 per cent. of our cases show a positive or partial Wassermann reaction with the blood serum, the percentage of partial reactions being very small. In syphilis of the nervous system 80 per cent. give a positive or partial reaction. My results in syphilis of the nervous system are 68 per cent. complete positive, 12 per cent. partial, and 20 per cent. negative. This is approximately the same as is found in tertiary syphilis in general.

Second—*As to the Wassermann Reaction with the Cerebro-Spinal Fluid.*—Concerning this reaction I believe we are now justified in concluding that if, when properly carried out, a complete positive reaction is obtained with the spinal fluid, it most certainly means that we are dealing with syphilis of the nervous system or parasyphilis, and my experience indicates that fifteen in every sixteen cases showing such a reaction are cases of general paralysis. That is to say, about 5 per cent. of the cases of syphilis of the nervous system and 80 per cent. of the cases of paresis show a positive reaction in the fluid.

*The Protein Content of the Spinal Fluid.*—An increase of the protein content of the spinal fluid indicates an organic disease of the central nervous system. Aside from acute meningitis it is found more constantly increased in syphilitic and parasyphilitic diseases, although it is not uncommon to find it increased in non-syphilitic conditions, as in some cases of cerebral arteriosclerosis with softenings, cerebral and spinal tumours, &c. It is increased in practically all cases of paresis and in about 90 per cent. of the cases of syphilis of the nervous system. Repeated examination of cases of syphilis of the nervous system, and especially examination in the earlier stages of the disease, would probably show a higher percentage.

*The Cell Content of the Spinal Fluid.*—First, as to the total cell count.

The cell content of the spinal fluid does not run parallel with the protein content. While I have always found an increase of protein where there is a pleocytosis, the reverse has not always been the case. I have found a number of times an increase of protein sufficient to give a positive Nonne-Apelt or Noguchi butyric acid reaction with a cell count well within the normal limit, and it is generally found in non-syphilitic conditions or in long-standing cases of syphilis of the nervous system. In this

connection I may mention that I have never found a cell-free spinal fluid. Included in my cases are several supposedly normal individuals including a child six months of age, a number without nervous or mental diseases, psychoneurotics, many cases of dementia præcox, &c., but they have all shown some cellular elements. Cellular elements have not always been found by the French method and the Fuchs and Rosenthal method, but by the Alzheimer they have been found invariably.

In paresis 100 per cent. show a pleocytosis. The degree varies from time to time, being as a rule higher in the early stages of the disease. As a rule the cell count in paresis is less than 200 per c.mm., rarely above 300. My highest cell count in this disease was 826 in a very acute case, the lowest six cells in a case of six years duration. In syphilis of the central nervous system the cell count varies much more than in paresis. As in paresis, we find the highest cell counts in the early stage of the disease, but unlike paresis it is not uncommon to find later in the disease, especially in long-standing cases, a cell count well within the normal limit, even though the patient may not have had anti-syphilitic treatment, and may even show more pronounced clinical symptoms. It is not difficult to understand this condition when we consider the pathology of the disease. The degree of pleocytosis in syphilis of the nervous system varies according to the form of the disease. The greater the meningeal irritation the greater the pleocytosis. The pure endarteritic form of the disease is said to show no cerebro-spinal pleocytosis; naturally we would not expect a pleocytosis in this condition, but the pure endarteritic form of the disease is very rare. I have had but one case which showed histologically the pure endarteritic form of cerebral syphilis, and two years before death this case showed a cell count in the fluid of thirty-one cells per c.mm. I think it quite probable that the great majority of the cases which show chiefly a specific endarteritis would have shown earlier in the disease a greater degree of perivascular and meningeal infiltration.

In considering the diagnostic value of cytological examination of the spinal fluid in diseases of the nervous system occurring in the early secondary stage of syphilis, as for example, in suspected cases of nervous relapse following the use of antisymphilitic treatment, we must bear in mind that about 50 per cent. of the cases of secondary syphilis show a cerebro-spinal pleocytosis with-

out manifesting any clinical evidence of disease of the nervous system.

*The Differential Estimation of the Cells of the Cerebro-Spinal Fluid.*—For illustrations and technic, see Bulletins Nos. 1 and 2, Government Hospital for the Insane, 1909 and 1910; also *Folia Neuro-biologica*, Band v., No. 3, 1911. We are not sufficiently well acquainted with the differential cell count to say what its diagnostic value is for the syphilitic diseases of the nervous system. Cells classified as lymphocytes as a rule constitute the great majority of the elements found in the fluid in all chronic conditions which show a pleocytosis. I do not believe that the estimation of the three or four varieties of lymphocytes is of any great value in assisting us to differentiate tertiary syphilis of the nervous system from paresis and tabes. It has been claimed that the small lymphocytes are more numerous in cerebral syphilis, and that the large varieties are found in excess in paresis. Some investigators, however, claim the reverse. My experience leads me to believe that the small lymphocytes are generally more numerous in syphilis of the nervous system than in paresis, but this certainly does not hold for a very high percentage of the cases as shown by the examination of many cases of the two diseases made at the same time, and by exactly the same technic. Furthermore, these elements vary from time to time especially in cases of cerebral syphilis.

In regard to the cells, which I have classified as large mononuclear cells for want of a better term, I find that they are, as a rule, in greater numbers in cases with a comparatively low cell count such as we find more frequently in long-standing cases of both syphilis and paresis and in cases under treatment. They are found in all fluids, normal and pathological, and seldom exceed 15 or 20 per cent.

*Plasma Cells.*—These elements have been found in five conditions in my experience, namely, syphilis, parasyphilis, tubercular meningitis, poliomyelitis, and acute meningitis. Concerning the value of the presence of these elements for differential diagnosis, I can only say that they are more constantly found in the fluid in paresis than in tertiary syphilis of the nervous system, although the highest plasma cell count that I have ever found was in a case of cerebral syphilis. In this case there was a very high total cell count. Under treatment there occurred a marked fall in the

pleocytosis, as shown by several spinal punctures. It was just after the first most pronounced fall in the cell count that a high percentage of plasma cells was found. The percentage of these elements is generally less than 5 per cent., very rarely over 10 per cent.

Polymorphonuclear leucocytes are found in the fluid in many cases of syphilis and parasymphilis, although, as a rule, the percentage is very low. They appear to be somewhat more commonly found after convulsive attacks in syphilis and paresis, but I have not found them in all cases after convulsive attacks, and have found them to rather suddenly appear in the fluid in cases of paresis without convulsive attacks.

Gitterzellen and microphages are found in the fluid in many cases of paresis—less frequently in syphilis. They are found in very small numbers and are essentially pathological elements. The percentage of Gitterzellen may be quite high in cases of extensive cerebral softening.

Endothelial cells and fibroblasts are frequently observed in fluids in which there is a cell increase, but they may occasionally be found when the cell count is not above 5 per c.mm.

Cellular elements are found in the fluid in most cases which we are unable to classify, but with our improved technic the percentage is generally quite small.

I fully appreciate the fact that the classification that I have given of the cells of the spinal fluid is far from satisfactory.

#### THE LUTIN CUTANEOUS REACTION OF NOGUCHI.

This very interesting and important reaction I will refer to here but briefly, because its practical value in neurological and psychiatric practice is as yet rather limited. Naturally it does not aid us in localising the disease process any more than the Wassermann reaction with the blood serum does. It appears to be a specific reaction for syphilis; this is more than we can say of the Wassermann reaction. In syphilis in general it is not found positive in a higher percentage of cases than is the Wassermann reaction, but it is found positive in a higher percentage of cases of late syphilis—cases in which the Wassermann reaction is so frequently negative so that its greatest value to us is under such circumstances as the following: We have a case of organic disease of the nervous system with no history of syphilis, and

showing a persistently negative Wassermann reaction in both blood and spinal fluid. There may be a mild degree of pleocytosis and an increase of protein, or, as sometimes occurs in cases of longer standing, there may be an increase of protein and a normal cell count; such conditions as are found in cases where there is chiefly a specific cerebral endarteritis. The question is: Has the patient syphilis or not? If such a patient had syphilis he would most probably give a positive luetin reaction, because experience has shown that it is in the tertiary stage of the disease, in cases that are latent or near latent, which give the highest percentage of positive luetin reaction—about 90 per cent. If such a case gave a positive luetin test, it would be a weighty factor in the diagnosis. I do not mean to say that it would be conclusive. We are seldom able to make an absolutely certain diagnosis of syphilis of the nervous system except by histological examination of the nervous tissue, and we know that occasionally it is not possible even then.

#### THE PROVOCATIVE WASSERMANN REACTION.

This reaction is of some value, chiefly as a guide to treatment, but I think that we have not had a sufficiently long experience with the use of salvarsan to say that a patient is cured of syphilis even though the test may be negative two or three years after the discontinuance of treatment.

A word as to the quantitative Wassermann reaction.

The variation of the quantities of some of the ingredients of the Wassermann reaction may perhaps be used to some advantage under certain circumstances. It may perhaps be used to a certain extent with the spinal fluid, but when we deal with the blood serum other factors enter which complicate matters so that further work is necessary before we can determine whether it will prove to be of use. We must proceed with extreme caution in interfering with the standard of the Wassermann reaction, as we still have some things to learn concerning it, and false conclusions may be drawn very readily.

The very important matter in connection with this subject—namely, the findings by the various tests referred to above in cases of *tabes*—has not been considered except where the term “*parasyphilis*” is used. I have not done so because my experience with this disease is rather limited. I have but thirty-

six cases of tabes in my series. They were in various stages of the disease; some had not been completely examined—that is, they had not had all of the tests applied, and some had had treatment before the tests were made, so that my statistics on this disease are of practically no value. Judging from the work of others it is difficult to make a definite statement concerning the laboratory tests in tabes in general, it being important to consider the stage of the disease. However, the general rule is—Wassermann reaction in the blood, positive—about 80 per cent.; an increased protein in the spinal fluid, nearly 100 per cent.; a cerebro-spinal pleocytosis, over 90 per cent.; and a negative Wassermann in the spinal fluid. The percentage of positive Wassermann reaction in the spinal fluid varies according to different investigators between 10 per cent. and 40 per cent. In tabo-paresis the percentage of positive Wassermann reactions in the spinal fluid is high. For a detailed account of this subject I refer to the most excellent work of Nonne of Hamburg.

It is difficult for me to summarise this paper, as it is but little more than a summary in itself. As previously stated, we have no very great difficulty when all the tests can be applied and repeated if necessary in deciding whether a given case belongs to the syphilis-parasyphilis group, but we have difficulty in differentiating within this group. We cannot lay down any very definite rule concerning the reactions as a whole. We are only beginning to learn the relative value of the many combinations of reactions met with in various conditions, and it behoves us to study them carefully in as many cases and in as great a variety of conditions as possible. Some years ago 25 per cent. of our cases of paresis were not properly diagnosed, as shown by histological examination, whereas now we rarely fail to diagnose this condition. We still find, however, that the diagnosis of paresis is sometimes made where paresis does not exist. In such errors the correct diagnosis generally proved to be cerebral syphilis. When the clinician now fails to diagnose paresis in cases where the laboratory tests have been applied, as sometimes occurs in the early stages of the disease when the symptoms are not definite, I have reason to believe that the error is due in part at least to misinterpretation of the tests, especially the Wassermann reaction in the spinal fluid. I have known several instances where the clinical symptoms were quite definite for paresis, but the diagnosis

of cerebral syphilis was made because the Wassermann reaction in the fluid was negative or partial. We should bear in mind that about 20 per cent. of our cases of paresis show a negative Wassermann in the spinal fluid.

The various tests are to be looked upon as the property of the clinic—they are indispensable in the clinic, and it is essential that the clinician understands their proper meaning as far as is known.

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### A CASE WITH TRANSIENT ATTACKS OF PARALYSIS: AUTOPSY.

By WALTER K. HUNTER, M.D., D.Sc.,  
Muirhead Professor of Medicine, Glasgow University ; and

M. E. ROBERTSON, M.B., Ch.B.,  
Assistant Pathologist, Glasgow Royal Infirmary.

(With Plates 26 and 27.

THE etiology of the transient attack of paralysis is a matter which has created no small amount of interest, and the record of the following case is offered as a contribution to the discussion of the subject.

R. M., aged 55, an engineer by occupation, was admitted to Ward 12 of the Glasgow Royal Infirmary, on 29th January 1912, on account of a difficulty in speaking. It was impossible, owing to this disturbance of speech, to obtain a detailed history of the course of the illness, but it was elicited that the loss of speech came on suddenly twelve months previously, and that for a period of three months the patient was unable to articulate a single word. Subsequent to that there was a partial recovery, the patient being able to speak again, although very indistinctly, and always after some preliminary stammering.

Coincident with the loss of speech there was paralysis of the right side of the body. The duration of this hemiplegia is uncertain, but the patient seemed to make a good recovery, and he was able to resume work after an interval of six months.

He was one of a family of seven, four of whom were dead, of causes unknown to patient. The others were healthy. He was married, and had had two children, who were both alive and well.

On admission to hospital he was found to be a well-nourished



and healthy-looking man. The pupils were equal, and reacted to light and accommodation. There was no appearance of facial paralysis, and mastication and deglutition were carried out without any apparent difficulty.

There was some paresis of the tongue; but this seemed to vary from time to time. Sometimes the tip of the tongue could not be protruded beyond the lips, and at other times there was no such disability. There seemed, however, to be a permanent difficulty in moving the tongue to the right. Articulation was defective, but this varied a good deal from time to time, the patient speaking much more distinctly at one time than at another. The voice was always rather high-pitched, and the words were always spoken in a halting and stammering manner. The cough was noted to have a somewhat toneless quality.

There was no paralysis noticeable in the arms or legs. The tendon jerks in the four limbs were rather active, but the plantar reflexes were both flexor.

The cardiac area was within normal limits. A ventricular systolic murmur was to be heard at the apex. At the base the first sound was indistinct, and the second had a metallic quality.

The respirations numbered 24 per minute, and were mainly abdominal in character, the chest moving very little even on deep inspiration. The examination of the lungs otherwise was negative, and there was nothing abnormal to be made out on examination of the abdomen.

The urine had a specific gravity of 1020, and was free from albumen, sugar, pus, or bile.

Two days after admission the patient had the first of the recurring attacks of paralysis. It was at one o'clock, and he was sitting up in bed taking his midday meal, when suddenly he fell back on his pillow. He was quite unable to speak. His mouth was drawn to the right side, and the muscles of the right cheek were seen to be twitching. The left arm was limp and helpless, and the patient indicated that there was something wrong with the left leg, for he could not raise it from off the bed. The face was pale and the pulse of poor quality. The paralysis lasted for about ten minutes, and then the patient began to talk, although very indistinctly. Still, he was able to explain that he felt all right again. A quarter of an hour later, however, he had a similar seizure, lasting for five minutes.

## TRANSIENT ATTACKS OF PARALYSIS: AUTOPSY 421

The following day (1st February), again at one o'clock, there was a third attack of paralysis, with much the same characters as the first two. The face was pale, the mouth being drawn to the right, with twitching of the muscles on the right side of the mouth. Speech was apparently impossible, nor could the tongue be protruded. There was also paralysis of the left arm and left leg: the attack lasted for four minutes. It was followed, twenty minutes later, by yet another seizure; but this time there was no twitching of the facial muscles.

There was no loss of consciousness during any of the attacks, and no sensory disturbances.

On 2nd February there were again two seizures, and on 3rd February three seizures, each lasting about three minutes. Between the seizures the patient could move his arm and leg quite well.

After this he remained free from paralysis till 6th February, when he had fourteen "seizures" between 10.45 A.M. and 12 midnight. He was quite unable to speak all this time, and he vomited frequently. The onset of each attack was recognised by a cyanosed appearance of the face and a stertorous breathing. During the attacks the patient was unable to open his mouth or to move his left arm or leg.

From this date onwards there was no repetition of the seizures, but the next morning (7th February) there was noted to be complete paralysis of the left arm and leg, and there was slight drooping at the left angle of the mouth. There was some rigidity of the affected limbs. The tendon reflexes were exaggerated in both arms and in both legs, but there was neither knee nor ankle-clonus on either side. The plantar reflex on the right side was flexor; on the left it was definitely extensor. The abdominal reflexes were present. At this time the patient would not attempt to speak. Indeed, he did not seem to be able to move his lips, to separate them, or to purse them up as in blowing. But on yawning, as he did frequently, the mouth opened widely and the lips became considerably retracted. Neither did he seem to be able to move the tongue. But there was no paralysis of the muscles of the eyeballs, and no paralysis of the muscles of respiration.

This left-sided hemiplegia, as well as the bulbar symptoms, persisted, and a few days later (11th February) the patient passed

into a semi-comatose condition, and would make no response when spoken to. He swallowed milk, however, but swallowing was attended with a good deal of coughing, and milk would escape from the angle of the mouth. There was involuntary emptying of the bladder, and this had been present since the onset of the hemiplegia. It is also to be noted that during the transient attacks of hemiplegia the urine was passed involuntarily. The breathing had now become rapid, fifty-four per minute, stertorous, and chiefly abdominal in type. The pulse, however, remained good. Ultimately the patient became much cyanosed, and he died on 13th February, a fortnight after admission into hospital.

At the *post-mortem* examination the heart presented the appearances of both hypertrophy and dilatation. The myocardium was soft, and there were little hæmorrhagic areas suggestive of an acute myocarditis. There was no valvular lesion. The coronaries were thickened with areas of patchy arterio-sclerosis, and at one point, one and a half inches from the orifice of the anterior coronary, the lumen was almost completely occluded. The aorta was also atheromatous. The lungs were emphysematous, slightly œdematous, and there were signs of old tuberculous disease at the apices. The liver was congested, but showed no signs of cirrhosis. The spleen seemed normal. The renal vessels were thickened and the cortex of the kidneys was rather narrow, but otherwise the appearances were normal.

The dura mater was firmly adherent to the cranium about the vertex. The general appearance of the surface of the brain was one of slight congestion, and the pia-arachnoid was possibly a little thickened. No softening could be felt anywhere.

The arteries at the base showed an extreme patchy sclerosis, and a number of the patches completely surrounded the vessel, looking like the thick knot on an earthworm.

The right posterior cerebral showed a particularly advanced obliterating arteritis—scarcely any lumen being left—and most of the other main branches showed patches of very considerable narrowing.

A horizontal section (Fig. 1) through the brain showed, on the left side, three small old softenings. Two were in the lenticular nucleus. The first, about the size of a large pea, was situated just external to the posterior part of the anterior limb of the internal capsule, and extended upward and inwards above this limb of the

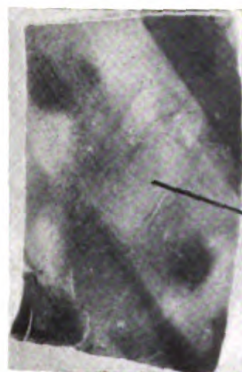
L.

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FIG. 1.

WEIGERT-PAL SECTIONS.



Area of Sclerosis.

FIG. 2.—Left Internal Capsule.

L.

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FIG. 3.—Crura—just below Cerebrum.



capsule, but did not reach the floor of the lateral ventricle. The second was a good deal smaller, and was to be seen lying posterior and external to the larger softening. The third softening was very small, and was situated about the middle of the optic thalamus.

Occupying almost the whole of the anterior, two-thirds of the posterior limb of the internal capsule, as well as the genu, was a firm, yellowish, sclerotic patch. The patch was incompletely divided into two by a narrow strand of white matter—the posterior part of the patch being about twice as large as the anterior.

On the right side there was an oval area of recent softening,  $\frac{1}{2}$  inch in length, in the posterior limb of the internal capsule—the anterior end of the softening being  $\frac{3}{8}$  inch posterior to the genu.

Sections were made from the internal capsules on both sides—the crura and medulla at various levels, and from the cervical, dorsal, and lumbar portions of the cord, and were stained by the Weigert-Pal and Marchi methods. Cord sections were also stained with hæmalum and eosin, and with toluidin blue.

One or two of the posterior root ganglia (lumbar) on either side were examined, some being stained by the Weigert-Pal and Marchi methods, others with toluidin blue.

#### *Weigert-Pal Sections.*

(1) *Left Internal Capsule* (Fig. 2).—This showed a very well-marked sclerosis in the posterior limb of the internal capsule, occupying the firm yellowish area observed on naked eye examination. Very few myelinated fibres remained except in the narrow dividing strand of whiter tissue previously mentioned, where a number of healthy fibres, chiefly running in a transverse direction, were still present. No sclerosis could be made out in the right internal capsule.

*Crura* (just below their entrance into the cerebrum) (Fig. 3).—There was a sclerosed area occupying two-thirds of the inner half of the left crus. The remaining one-third of this half of the crus (the part nearest the median line) showed myelinated fibres.

The right crus appeared healthy.

A little lower down (about midway between the upper end of the pons and the cerebrum) (Fig. 4) there was still a very well-marked area of sclerosis occupying two-thirds of the inner half of the left crus. The innermost one-third of this half of the crus

appeared healthy, as did the outer half of the crus. No lesion could be made out in the right crus at this level.

*Upper Part of Pons* (Fig. 5).—Sclerosis of the pyramidal bundles on the left side is well marked—more especially towards the median line. The lateral parts of the bundles, except the most ventral, which is almost completely sclerosed, appear fairly normal. Those portions of the ventral bundles on the right side, which lie nearest the median line, show slight pallor.

*Lower Part of Pons* (Fig. 6).—Here, where the pyramidal bundles are gathered more closely together, sclerosis was very definite in the ventral and median part of the bundle of fibres on the left side.

On the right side there was a small sclerotic area in the upper and median part of the bundle of pyramidal fibres.

*Medulla* (about middle) (Fig. 7).—There was distinct pallor of the left pyramidal bundle, especially in its upper and median part, but sclerosis was not nearly so well-marked as in the pons or left crus.

In the lower part of the medulla (Fig. 8) there was only slight pallor of the left pyramidal bundle.

*Cord* (Fig. 9). *Cervical*.—There was slight pallor on both sides in the pyramidal pathway—most marked on the right.

*Dorsal*.—Same as cervical, only less marked.

*Lumbar*.—Same as dorsal—difference between the sides very slight indeed.

#### *Marchi Sections.*

*Internal Capsules, Left Side* (Fig. 10).—There was a very well-marked blackening in those areas shown by the Weigert-Pal sections to be sclerosed.

The sclerotic areas were crowded with cells containing fat droplets—these cells clustered especially round the vessels.

Blackening was most pronounced just about the middle of the posterior limb of the internal capsule.

*Right Side* (Fig. 11).—In the softened area already described as occurring in the internal capsule of the right side a very few scattered black dots were seen.

*Crura—just below Entrance to Cerebrum* (Fig. 12), *Left Side*.—There was a very pronounced Marchi degeneration in the inner half of the left crus—the fat droplets for the most part being



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WEIGERT-PAL SECTIONS—*continued*.



FIG. 4.—Crura—a little above Pons.



FIG. 5.—Pons—high up.



FIG. 6.—Pons—low down.



FIG. 7.—Medulla—high up.



FIG. 8.—Medulla—low down.



Cervical.

Dorsal.

Lumbar.

FIG. 9.—Cord.



1871

# MARCHI SECTIONS.

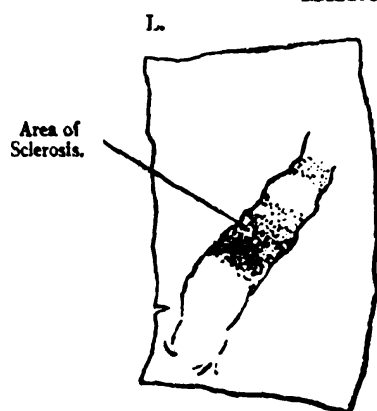


FIG. 10.—Left Internal Capsule.

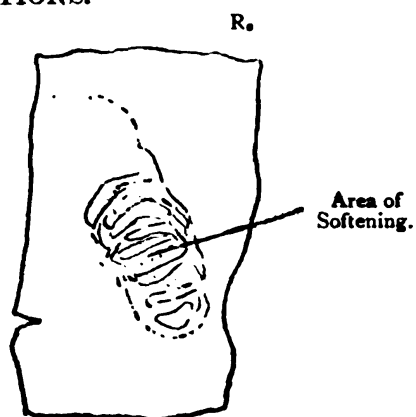


FIG. 11.—Right Internal Capsule.

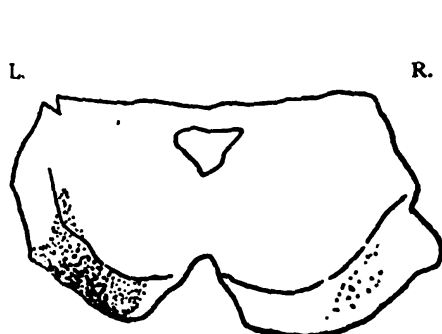


FIG. 12.—Crura—just below Cerebrum.



FIG. 13.—Crura—a little above Pons.

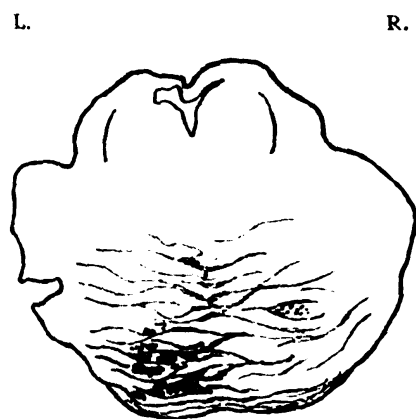


FIG. 14.—Pons.

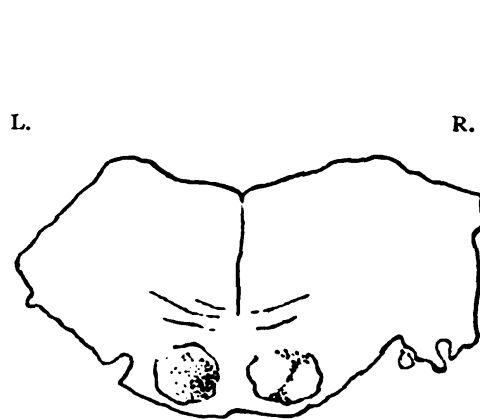


FIG. 15.—Pons—low down.

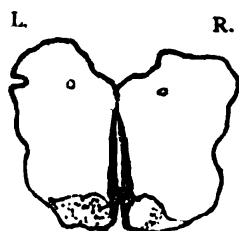


FIG. 16.—Medulla—just below Pons.

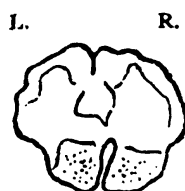


FIG. 17.—Medulla—low down.



Cervical.



Dorsal.



Lumbar.

FIG. 18.—Cord.

contained in cells. The greatest amount of blackening was in the middle part of this inner half of the crus. A small area, just at the innermost part of the crus, was free from blackening.

*Crura—a little above the Pons* (Fig. 13).—The innermost half of the left crus showed marked blackening—in this case extending quite to the median edge of the crus.

The most dense blackening was about the middle of the inner half of the crus. In the right crus, in the sections at both levels, a very slight degeneration was seen in the middle third.

*Pons—about the Middle* (Fig. 14).—The more ventral bundles of longitudinal fibres on the left side showed pronounced degeneration—most marked towards the median raphe. On the right side there was one small blackened area about the middle, as regards depth and towards the lateral aspect of the pons.

*Pons—Lower End* (Fig. 15).—Here the whole of the pyramidal bundle on the left side showed degeneration, but blackening was most marked towards the median raphe.

On the right side there was an area of blackening of peculiar shape—stretching in a thin line across the middle of the pyramidal bundle, and widening out fan-wise at either end.

*Medulla*—(Figs. 16 and 17).—There was degeneration in the pyramidal fibres on the left side—much less marked than in the pons, but still quite definite. There was only a very slight patch of degeneration on the right side.

*Cord* (Fig. 18), *Cervical*.—There was a slight degree of blackening in both pyramidal pathways about equally marked on either side.

*Dorsal*.—Here the condition was much the same.

*Lumbar*.—Blackening was so slight as to be scarcely noticeable.

In all the cord sections there was a degree of generalised blackening which seemed to be due to deposit from the stain.

#### *Toluidin Blue Sections.*

*Posterior Root Ganglia (Lumbar)*.—The nerve cells stained rather darkly and diffusely, and showed a good deal of pigment.

There was some slight proliferation of the capsular cells, but this was not a noticeable feature. Mast cells were numerous.

*Cord*.—The nerve cells of the cord did not show any chromolytic changes.

The sections of the posterior root ganglia stained by the

Marchi and by the Weigert-Pal methods did not show any degenerative changes.

There is little one need add to this case by way of commentary. The actual cause of death seemed to be paralysis of the respiratory apparatus, and this was probably due to narrowing of the vessels at the base of the brain interfering with the circulation of the bulb. Transient spasm of these sclerosed vessels was probably also the cause of the seizures of cyanosis and stertorous breathing noted on 6th February. That there had been some involvement of the circulation of the bulb was shown at the autopsy, in the presence of a small softening about the centre of the pons.

The symptoms otherwise seem to have been determined by the lesions in the internal capsules. The recurring attacks of left-sided hemiplegia were presumably caused by transient spasm of the branches supplying the right internal capsule, and when occlusion of these vessels ultimately became permanent, softening of the capsule supervened, with the persistent hemiplegia noted on 7th February. That this softening was recent is shown by the almost complete absence of degeneration in this motor pathway, even with the Marchi method of staining.

The right-sided hemiplegia which came on twelve months prior to admission to hospital is to be explained by the older lesion in the left internal capsule. This softening must have involved chiefly the fibres going to the bulb, for the descending degeneration is much more marked in the crus and pons than in the medulla, and it is scarce noticeable in the motor pathway in the cord. The very complete recovery, too, of the right arm and leg, with the absence of Babinsky's signs, is also to be explained by the lesion limiting itself mainly to the bulbar fibres. The disturbance of articulation which was present on admission was probably of the nature of a dysarthria, due to the lesion in the anterior part of the posterior limb of the left internal capsule. But it should be noted that the defect of articulation varied from day to day, and it may, therefore, have some relationship to the softening in the lenticular nucleus, for this same variability in speech has been noted in other cases of lenticular degeneration.

There was probably also some interruption of a proportion of the fibres of the anterior limb of this left internal capsule, for with the Marchi staining degenerate fibres are seen in crus (Fig. 13) to extend quite to the inner limit of the pyramidal fibres.

But the various softenings in the region of this internal capsule are doubtless of different ages, and this partly explains why certain groups of fibres show degeneration with Marchi's stain, and others with Weigert's stain.

The recurring attacks of complete loss of speech (first noted on 31st January) which accompanied the recurring attacks of left-sided hemiplegia must have been of the nature of a pseudo-bulbar paralysis. That is to say, there was a permanent lesion in the bulbar fibres of the left internal capsule, and an intermitting (ischaemic) affection of the corresponding fibres in the right capsule. When the left-sided hemiplegia became permanent, so did the loss of speech, as well as the other bulbar symptoms. It is true that the softening which produced this hemiplegia did not seem to extend quite to the genu of the right internal capsule, but nevertheless the function of the bulbar fibres must have been disturbed by the lesion in their near neighbourhood. Also, if we take the distribution of the degenerate fibres in the left internal capsule (Figs. 2 and 10) as some indication of the disposition of the bulbar fibres in the capsule, it is apparent that they extend over an area which extends much further back than the genu.

It is interesting to note that at the time when the bulbar paralysis seemed complete, when the patient could not voluntarily open his mouth, or move his lips or tongue, that with an automatic movement like yawning the mouth was opened wide and the lips much retracted. Probably such automatic movements are initiated in the central ganglia, being quite independent of the cerebral cortex.

The involuntary emptying of the bladder during the recurring attacks of hemiplegia with bulbar symptoms, in spite of the fact that the patient remained fully conscious, is of interest, in that polyuria and incontinence of urine have been not infrequently met with in cases of pseudo-bulbar paralysis. It is to be noted, too, that the bladder trouble persisted after the pseudo-bulbar symptoms became permanent.

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## Abstracts

### ANATOMY.

**THE MOTOR CORTEX AND PYRAMIDAL TRACT IN THE**  
(358) **RACCOON** (*Procyon lotor*, Linn.). SUTHERLAND SIMPSON,  
*Proc. Soc. Exp. Biol. and Med.*, 1912, x., Dec. 18, pp. 46-47.

It is generally believed that the direct pyramidal tract is limited to man and the anthropoid apes; but this is not the case, as it is present in the raccoon and in the porcupine (*v. infra*).

The author exposed the cerebral cortex on the left side, located the motor area by stimulation, and removed it. The animals (five in number) were killed two weeks later, and the brain and cord examined by the Marchi method. It was found that while the pyramidal fibres cross the mesial raphe into the lateral column of the cord, in three animals a large number of the fibres remained uncrossed, and formed a direct ventral pyramidal tract extending along the margin of the ventral median fissure. This tract could be traced to the mid-dorsal region. A. NINIAN BRUCE.

**THE PYRAMIDAL TRACT IN THE CANADIAN PORCUPINE,**  
(359) (*Erethizon dorsatus*, Linn.). SUTHERLAND SIMPSON, *Proc. Soc. Exp. Biol. and Med.*, 1912, x., Oct. 16, pp. 5-6.

IN the guinea-pig, mouse, rat, and squirrel, and in the monotremes and marsupials, the crossed pyramidal tract lies in the dorsal, and not in the lateral column of the cord.

The author located the motor cortex in the porcupine by electrical stimulation, and extirpated it in the usual way. The resulting degeneration was examined by the Marchi method, and it was found that in this animal the decussation of the pyramids is incomplete, the fibres dividing into four bundles, two crossed and two direct—a crossed dorsal and a crossed lateral pyramidal tract, and a direct ventral and direct dorsal pyramidal tract. The crossed lateral and direct dorsal tracts pass as far down as the upper dorsal region, while the crossed dorsal and direct ventral tracts are much larger than the other two, and can be traced as far as the lower sacral segments. A. NINIAN BRUCE.

**THE PHYSIOLOGICAL ANALYSIS OF THE POSTERIOR LONGITUDINAL FASCICLE.** L. J. J. MUSKENS, *Le Névrase*, 1913, xiv., p. 299. (Manuscript accepted for publication, Dec. 1912.)

IN a large number of animals (cats and rabbits) the posterior longitudinal bundle formation and the vestibular complex were severed in different ways. Accurate notes were taken about the forced movements in two planes; circus movement and the allied phenomenon of conjugate deviation of the head and eyes; rolling movements and their minor manifestations, *e.g.*, tendency to fall or to lie down on one side. The specimens were examined by the Marchi method. From this set of experiments, together with a complementary set of observations after direct lesion to the vestibular nuclei, proof was forthcoming that in the entire P.L.B. formation including its lateral horns, are found ascending tracts arising from the homolateral and heterolateral vestibular nuclei. Only in the innermost part of the P.L.B. two strands of fibres were found degenerated in those cases of lesion of the region of the posterior commissure, that had shown particular forms of forced movements, both tracts having apparently different functions. These tracts having been named by the author in this paper, and his previous publications (*Transactions of the Netherlands Royal Academy*, Oct. and Nov. 1912), the commissuro-medullary and the interstitio-spinal tracts, indicating in that definite way their origin and termination. The first one is found degenerated after lesion of a cell-group, oral and dorsal to the red nucleus, the second thick-fibre tract after a lesion oral and lateral to the red nucleus. Both tracts are homolateral.

With this combined anatomical physiological method it was proved for the first time that after lesion to Bechterew's nucleus a homolateral ascending tract is exclusively found degenerated, and not, as in the case of lesion to Deiter's nucleus, a voluminous heterolateral and a less voluminous homolateral ascending tract.

AUTHOR'S ABSTRACT.

## PHYSIOLOGY.

**THE EFFECT OF THYROID EXTIRPATION ON THE HYPOPHYSIS CEREBRI IN THE RABBIT.** LYDA MAY DEGENER, *Quart. Journ. Exp. Physiol.*, 1913, vi., p. 111.

THE thyroid glands were completely removed from twelve adult rabbits, which were killed at periods varying from 10 to 179 days after the operation. The hypophyses were weighed after death, and found to be distinctly heavier than in control animals. The increase in weight appears to run parallel with the time that intervenes between thyroidectomy and the death of the animal.

After an interval of 179 days (six months), the pituitary had increased to about three times the normal size (*v. Review*, 1913, xi., p. 164).  
A. NINIAN BRUCE.

**AGE AS A FACTOR IN THE EFFECTS WHICH FOLLOW**  
(362) **THYROIDECTOMY AND THYRO-PARATHYROIDECTOMY**  
**IN THE SHEEP.** SUTHERLAND SIMPSON, *Quart. Journ. Exp.*  
*Physiol.*, 1913, vi., p. 119.

REMOVAL of the thyroid with the contained internal parathyroids in thirteen adult sheep, and sixteen lambs from 7 to 8 months old, led to practically no ill effects. As the result of a similar operation, three lambs about 2 months old became typical cretins. The complete operation (thyro-parathyroidectomy) in four adult sheep was followed by no symptoms during the time (3 to 4 months) they were under observation. The same operation (thyro-parathyroidectomy) in four young lambs (5 to 7 weeks) resulted early in acute and fatal tetany. Removal of the two external parathyroids from the three cretins when about 1 year old was followed by only slight symptoms. With regard to the effects, both of thyroidectomy and of parathyroidectomy in the sheep, age is a very important factor.  
A. NINIAN BRUCE.

## PATHOLOGY.

**INDICATIONS OF NERVE LESION IN CERTAIN PATHOLOGICAL**  
363) **CONDITIONS OF BLOOD-VESSELS.** T. WINGATE TODD, *Lancet*,  
1913, May 17, p. 1371.

THE mechanism of production of vascular changes in the lower limb is likely to be similar to that found in the upper limb. In view of the probable causation of vascular changes in "cervical rib" by a nerve lesion (*v. Review*, 1913, xi., p. 92), it is possible that a similar explanation may be found to hold good for certain other diseases exhibiting pathological changes of obscure origin in the blood-vessels. No explanation will be found satisfactory if it depends on the unproven and improbable hypothesis that sympathetic fibres for peripheral vessels pass to their distribution along the trunks of main vessels.  
A. NINIAN BRUCE.

**CONSIDERATIONS ON THE PATHOLOGICAL PHYSIOLOGY OF**  
(364) **CONTRACTURE.** (Considerazioni sulla fisiopatologia della contrattura.) M. BUSCANIO (of Florence). *Riv. di Pat. nerv. e ment.*,  
March, 1912.

THE author, after a review of the various views of the nature of contracture which have been formulated, concludes that when



muscles become immobile from suppression of the cortical impulses, contracture is due to nervous currents, of essentially toxic peripheral origin, which pass along the same reflex paths as the normal currents of muscular tone, passing mainly through the higher centres of tone before reaching the anterior horn cells. (Cp. *Review*, 1912, x., p. 571.) C. MACFIE CAMPBELL.

### CLINICAL NEUROLOGY.

**A REFLEX PHENOMENON IN THE UPPER LIMB—THE "FORE-ARM SIGN."** (Un phénomène réflexe du membre supérieure: Le "Signe de l'avant-bras.") ANDRÉ LÉRI, *Rev. Neurol.*, 1913, No. 5, March 15, p. 277.

THE author describes a reflex phenomenon which he has observed in the upper extremity, and which he calls the forearm sign. It is produced as follows. The observer instructs the patient to let the arm be quite lax, while he supports it under the wrist or forearm with his left hand. With his right hand, he then flexes the patient's fingers into the palm, flexes the palm on the forearm, rolls so to speak, the hand on itself, uses a little force, and then the patient's forearm is observed to flex gradually on the arm.

The author has investigated the phenomenon in 275 cases, 50 of which were non-nervous. He finds it is constantly present in the normal individual and in the absence of organic disease of the nervous system, and though varying in different individuals is equal on the two sides of the same individual. Its centripetal path is probably by way of one of the sensory nerves of the skin or wrist. It can be considered pathological only when it is completely, or almost completely, absent, or is asymmetrical (that is, enfeebled on one side). It can disappear when there is an organic lesion in some part of the reflex path above the fifth cervical segment, or in the sensory or motor tracts from this level to the cerebral cortex.

P. W. SAUNDERS.

**AN ORGANIC SIGN—"THE FLEXION OF THE KNEE."** (Un signe (366) organique: La flexion du genou.) NOICA and PAULIAN, *Rev. Neurol.*, 1913, xxi., No. 5, p. 288.

A NORMAL individual lying on his back with legs extended is able to raise his legs from the ground with the knee kept extended. A hemiplegic or a paraplegic in raising the affected leg *always* bends the knee. The phenomenon depends on a weakness of the extensor muscles of the knee, and may be found not only in lesions of the pyramidal tract, but in, say, an alcoholic polyneuritis.

P. W. SAUNDERS.

**THE INTERNEURONIC SYNAPSE IN DISEASE.** B. HENRY  
(367) SHAW, *Brit. Med. Journ.*, 1913, May 10, p. 989.

THE author considers that the delirium resulting from sudden nervous shock cannot satisfactorily be explained by the theory of nerve exhaustion, and that it is probable that a very intense nervous discharge may cause serious damage to the finer nerve arborisations and synaptic junctions, and that, just as under similar conditions electrically the fusion of a wire may take place, so here, as a result of intense shock, we may have some degree of what might be termed "synaptic fusion" of the higher neurone terminals and interneuronic membranes, causing dissociation of the higher centres, and misinterpretation of stimuli.

A. NINIAN BRUCE.

**GRAPHIC RECORDS OF RESPIRATORY PARALYSIS.** G. A.  
(368) SUTHERLAND, *Lancet*, 1913, July 12, p. 75.

PARALYSIS of the respiratory muscles is often difficult to detect, but may be easily recognised by means of graphic methods by the use of Mackenzie's ink polygraph, one bag being placed over the lower part of the abdomen and the other over the mid-sternal region. Under normal conditions of respiration the two curves are synchronous. If the diaphragm be paralysed, the thoracic tracing is normal and the abdominal tracing inverted. If the intercostals be paralysed the abdominal tracing is normal and the thoracic inverted.

A. NINIAN BRUCE.

**A PRELIMINARY NOTE UPON AN EXPERIMENTAL INVESTIGATION OF CONCUSSION OF THE SPINAL CORD AND ALLIED CONDITIONS.** ALAN NEWTON, *Brit. Med. Journ.*, 1913, May 24, p. 1101.

THE spinal cord is extremely sensitive to slight degrees of concussion and compression. Despite the slight anatomical changes demonstrable after lesser degrees of injury, the resulting disturbance of function is considerable. After concussion which has quite abolished motor efferent conduction, sensory conduction can still be demonstrated. Arrest of the spinal cord circulation by aortic compression abolishes spinal cord function in from fifteen to thirty seconds. The author considers that his experiments support the view that there is an organic basis for the signs and symptoms of "railway spine" and allied conditions of traumatic neurasthenia.

A. NINIAN BRUCE.

**A CASE OF CERVICAL ZOSTER.** (Un cas de zona cervical.) J. (370) GALIPPE, *Bull. Soc. de Péd. de Paris*, 1913, xv., p. 200.

A BOY, aged 14, with recent cervical zoster in the area of the second and third right cervical nerves, came to hospital the same day as his friend, a boy, aged 15, who presented a desiccating intercostal herpes in the area of the right fourth dorsal nerve. The former had developed the eruption four or five days after the latter, and as the two boys lived in the same house and saw each other daily, Galippe regards this as a case of contagion (*v. Review*, 1911, x., p. 531). J. D. ROLLESTON.

**SPONTANEOUS REDUCTION OF A DISLOCATION OF THE** (371) **CERVICAL VERTEBRAE.** W. C. BENTALL, *Brit. Med. Journ.*, 1913, July 12, p. 69.

THE patient was a man, aged 65, who fell from a tree on to his back. He was perfectly conscious, had no pain, but had no power in his arms or legs. That evening slight movement of his legs was noticed, which was increased next morning. There was no pain anywhere except on movement at the back of the neck, where he was also conscious of a creeping sensation. The arms were hypersensitive on their radial aspects, which is the area supplied by the fifth cervical root. Nothing was done, and two months later the patient could walk unaided, but could not dress himself or perform the finer movements. Fifteen months later he returned to work, but still had numbness in his finger-tips, and occasional twinges in the muscles of the neck.

A. NINIAN BRUCE.

**A CASE OF VOLKMANN'S ISCHÆMIC CONTRACTURE OF THE** (372) **HAND.** (2 Illust.) G. DE SWIETECHOWSKI, *Lancet*, May 17, p. 1380.

A GIRL, aged 12, fell and injured her left elbow. A fracture was diagnosed and a splint applied. Next day the left hand was swollen and very painful, and she had lost her power over the fingers. After six weeks' treatment no improvement had taken place.

She was seen four years later by the author, who found the wrist flexed *ad maximum*, the metacarpo-phalangeal joints hyper-extended, and both interphalangeal joints flexed to the highest possible degree like the wrist. The hand was much smaller than its fellow, and the muscles wasted. She was given passive move-

ment, massage, and various splints, their shape and application being altered every week. Great care had to be taken on account of the skin, the slightest pressure at first giving rise to sores. Later, faradism and Bier's elastic bandage were used, and it was expected that in a few months' time she would get the full use of her hand.

A. NINIAN BRUCE.

**THE FORM OF THE FIELD OF VISION IN TABETIC OPTIC (373) ATROPHY.** (*Die Gesichtsfeldformen der tabischen Sehnerven-atrophie*). K. LANGENBECK, *Klin. Monatsbl. f. Augenheilk.*, 1912, 1., August, S. 148.

IN 130 cases peripheral contraction was found in 81, nasal defects in 37, temporal in 33, above in 25, below in 7, and central in 18.

The fields fall into two main groups.

Group I. Loss of function occurs over the whole field, the colour fields become contracted, and vision is reduced. The contraction of the colour fields is often an early sign of the development of the defect before there is any loss for white. Early affection of the entire thickness of the optic nerve characterises this group.

Group II. Here the unaffected part of the field retains completely intact colour sensation right up to the boundary of the defect. The healthy and diseased parts of the nerve are sharply demarcated, and central vision may remain relatively good for some time.

As regards prognosis, it is not possible to make any distinction between these two groups.

Central scotomata occurred in fourteen cases, or about 10 per cent. of the author's material; they may, though rarely, be a manifestation of uncomplicated tabetic atrophy. In most cases these scotomata may easily be differentiated from those occurring in retrobulbar neuritis or toxic amblyopia, though occasionally the diagnosis may be doubtful for some time.

The author strongly combats the view of Fuch's that anything in the way of an inflammatory process ever occurs in uncomplicated tabetic atrophy. Hemiopic fields are rare and, in the author's view, not due to uncomplicated tabes. He agrees with the opinion, stated by Leber over thirty-five years ago, that such hemiopics are either due to an accidental symmetrical affection of the optic nerves or to a basal complication. Tabetic atrophy depends upon a purely peripheral affection of the optic nerves and not on any degenerative process of the chiasma or tracts.

H. M. TRAQUAIR.

**TABETIFORM GASTRIC CRISES IN ULCERATIVE CANCER OF**  
 (374) **THE LESSER CURVATURE.** (*Crises gastriques tabéiformes*  
*au cours d'un ulcéro-cancer de la petite courbure*). DUHOT  
 and LEROY, *L'Écho méd. du Nord*, 1913, xvii., p. 252.

MAN, aged 49. Tabes was excluded by the normal character of the reflexes, and of the cerebro-spinal fluid. Laparotomy showed cancer of the lesser curvature with deep and extensive infiltration. The severity of the pain was probably due to the cancer being grafted upon an ulcer. Reference is made to a similar case reported of Babinski, Chauvet, and Durand (*Soc. de Neurol.*, March 6, 1913).  
 J. D. ROLLESTON.

**HEMIPLEGIA IN SCARLET FEVER.** (*Hémiplégie au cours de la*  
 (375) *Scarlatine*.) P. SAVY and M. FAVRE, *Lyon méd.*, 1913, cxx., p. 1142.

A MAN, aged 19, suddenly developed right hemiplegia on the tenth day of an ordinary attack of scarlet fever. Death, preceded by coma took place forty-eight hours later. No necropsy. As there was no obvious cardiac lesion present during life, embolism was excluded, and thrombosis was regarded as a more probable explanation of the hemiplegia than encephalitis. Reference is made to the cases reported by the reviewer (*v. Review*, 1908, vi., p. 530) and by Gouget and Pelissier (*ibid.*, 1909, vii., p. 545).

J. D. ROLLESTON.

**DIPHTHERITIC HEMIPLEGIA.** (*Die Hemiplegia postdiphtheritica*.)  
 (376) W. H. LEEDE, *Zeitschr. f. Kinderheilk.*, 1913, viii., p. 88.

AMONG 6,300 cases of diphtheria admitted to the Hamburg-Eppendorf Hospital between October 1909 and January 1913, four developed hemiplegia, of which three were fatal.

1. Man, aged 24. Right hemiplegia on 16th day. Aphasia, hemianopsia, and albuminuria. Death on 18th day. Cerebral softening found at autopsy.

2. Girl, aged 8 years. Left hemiplegia on 25th day. Cardiac dilatation and enlargement of liver. Albuminuria. Recovery with spastic paresis and athetosis.

3. Male, aged 18 years. Left hemiplegia on 21st day of only twenty-four hours' duration. Cardiac dilatation and albuminuria. Death on 33rd day. Necropsy: Fatty degeneration of heart, but no macroscopical lesions in brain to explain hemiplegia.

4. Boy, aged 3 years. Right hemiplegia with aphasia on 23rd day. Albuminuria. Death on 46th day from broncho-pneumonia.

Necropsy showed softening of left corpus striatum, optic thalamus, and sub-thalamic region.

Cardiac thrombi were found in case 1 only. The paper contains a review of sixty-three cases from the literature.

J. D. ROLLESTON.

**MENINGISM IN SCARLET FEVER.** (*Meningismus bei Scharlach.*)  
(377) H. SACHS, *Jahrb. f. Kinderheilk.*, 1911, "Erg.-Heft.," p. 68.

DURING a period of nine months at the infectious department of the Virchow Hospital, Sachs found sixteen cases with clinical signs of meningitis among 400 scarlet fever patients. The occurrence of so many cases in a short time is attributed to the character of the epidemic. Two were adults, eleven children from 8 to 13, and three from 2 to 5 years of age. The disease ran much the same course in all. On admission, the patients had high fever and were in a comatose condition. The most frequent combination of symptoms was nuchal rigidity, Kernig's sign, hyperæsthesia and stupor. The symptoms lasted two or three days and then gradually subsided.

Lumbar puncture was made in fifteen cases. In only eight was there hypertension, and in one out of five examined there was an excess of albumin. None showed leucocytosis nor micro-organisms. The amount of fluid withdrawn varied from 3 to 50 c.c. Although the increase of pressure and amount of fluid were in favour of serous meningitis, the other findings contraindicated this, and autopsies, which were held in two cases, showed an absence of meningitis.

The pathological anatomy of meningism is unsettled, but the condition is probably brought about by a combination of vasomotor changes and damage to the central nervous system. The ætiology is also obscure. Probably meningism is due to the toxins of the unknown agent of scarlet fever or of streptococci. Diagnosis can only be made by lumbar puncture.

A clinical distinction between meningitis and meningism has not been established. The prognosis is on the whole good. The fatal issue of five cases in this series was due to the severity of the scarlatinal attack.

Treatment is symptomatic. Lumbar puncture was found only to be of benefit in cases with hypertension. J. D. ROLLESTON.

**MENINGISM. A REVIEW.** (*Meningismus. Uebersichtsreferat.*)  
(378) C. KAYSER, *Berl. klin. Woch.*, 1913, L. p. 1021.

THERE is hardly any infectious disease in which meningism has not been observed and described. French medical literature is

especially rich in illustrative cases. Sachs has recently found symptoms of meningitis in 4 per cent. of all his scarlet fever patients, while the lumbar puncture findings—no bacteria, no cellular elements, normal or occasionally raised pressure—justified the diagnosis of meningism. Laurel Stursberg and others have recorded meningism in typhoid, and several authors have observed it in pneumonia. Thus Kirchheim found it in 13 out of 500 cases. Schottmüller has recorded cases occurring in puerperal fever, measles, and whooping cough. It has also been noted in helminthiasis. In the few fatal cases on record only hyperæmia and œdema of the meninges have been found. The prognosis is good. There is never any paralysis or other cerebral disturbance left as a residue. Treatment is symptomatic. Relief is afforded by lumbar puncture.

J. D. ROLLESTON.

**SUBACUTE MENINGEAL SYNDROME OF SYPHILITIC ORIGIN.**

(379) (*Syndrome, méningé subaigu d'origine syphilitique.*) PIERRET and DUHOT, *L'Écho méd. du Nord*, 1913, xvii., p. 249.

MAN, aged 20. The symptoms suggested tuberculous meningitis. Acquired syphilis was denied, but the family history indicated the inherited disease. The cerebro-spinal fluid was clear, and showed intense lymphocytosis. Wassermann positive both in blood and cerebro-spinal fluid. Marked improvement followed injections of benzoate of mercury, but Wassermann remained positive, and the lymphocytosis though less was still appreciable.

J. D. ROLLESTON.

**TUBERCULOUS MENINGITIS IN ADULTS.** G. A. CRACE-CALVERT, (380) *Med. Press and Circ.*, 1913, ii., p. 37.

THE paper is based on seven cases that occurred among 520 cases of pulmonary tuberculosis treated by the writer in his sanatorium during the last eleven years. Six were males. The ages ranged from 29 to 44. The onset was usually very insidious. Headache was usually the most marked symptom. Vomiting was not so constant as in the child. Retention of urine was frequent. The abdomen was usually retracted, and the pulse quickened and irregular. Kernig's sign was present in all but two. *Tache cérébrale* was present in only one case. Optic neuritis was absent in at least four cases. No other ocular signs were noted. Coma usually developed several days before death.

The duration of the disease varied from nine days to six weeks (*cf. Review*, 1911, lx., p. 30, and 1912, x., p. 488).

J. D. ROLLESTON.

**TWO UNUSUAL CASES OF ENTERIC FEVER** SIR JOHN MOORE,  
(381) *Dublin Journ. Med. Sc.*, 1913, i., p. 419.

THE first of these was complicated by two relapses followed by catarrhal jaundice, but presented no nervous symptoms. The second was a case of "typhoid spine" in a man aged 38. Enteric fever developed in August, and ran a protracted course, being complicated by intestinal hæmorrhage. During convalescence in October pain occurred in the back and lower limbs, and was mistaken for rheumatism. On examination a globular swelling was found over the great trochanter and incised, but proved to be a phantom tumour, probably due to the flaccid gluteal muscles. The diagnosis now lay between toxic peripheral neuritis tuberculosis of the sacro-iliac synchondrosis and "typhoid spine," and was settled by the X-rays, which showed osteo-periostitis of the left side of the third lumbar vertebra and upper half of the fourth. Treatment consisted in rest to the spine, with massage of the back and lower limbs, but recovery did not take place till the beginning of March (*v. Review*, 1913, ix., p. 281).

J. D. ROLLESTON.

**APHASIA IN THE TYPHOID FEVER OF CHILDREN.** (L'aphasie  
(382) dans la fièvre typhoïde infantile.) M. BRELET, *Gaz. méd. de  
Nantes*, 1913, xxxi., p. 401.

APHASIA is a rare complication of typhoid fever; it is confined almost exclusively to children. In most cases it is an isolated symptom, unaccompanied by any other sign of involvement of the nerve centres. It usually appears at the height of the disease, more rarely in convalescence; sometimes during a relapse. After a variable time, three weeks on the average, complete recovery takes place. Pathogeny. With the exception of permanent aphasia, accompanied by hemiplegia where gross vascular lesions are present, aphasia in typhoid is due to slight circulatory disturbances (circumscribed œdema or anæmia) or to fine lesions of the nerve centres, readily admitting of repair.

The rapid disappearance of this toxic aphasia is due to the fact that in early life the brain can rid itself of its toxins much more readily than later.

J. D. ROLLESTON.

**PARALYSIS IN A DOG SIMULATING POLIOMYELITIS.** SIMON  
(383) FLEXNER and PAUL F. CLARK, *Journ. Exp. Med.*, 1913, xvii., p. 577

A PET dog developed a form of paralysis simulating the paralysis of epidemic poliomyelitis. The autopsy showed changes in the



spinal cord and intervertebral ganglia, resembling, but not identical with, the lesions of poliomyelitis in man. Inoculation of the affected spinal cord into the nervous system of young dogs and *Macacus rhesus* monkeys was not followed by the production of paralysis or other obvious symptoms of disease. The illustrations are particularly good.

A. NINIAN BRUCE.

**THE DIAGNOSIS OF CEREBRAL HÆMORRHAGE BY MEANS OF**  
(384) **LUMBAR PUNCTURE.** O. P. BIGELOW, *Cleveland Med. Journ.*, 1913, xii., p. 265.

BIGELOW, as the result of his observations, comes to the following conclusions: Cerebral hæmorrhage can be detected by examination of the spinal fluid in perhaps 90 per cent. of cases if the examination be made within three weeks of the "stroke." For the first four days or so there is a cloudiness or bloodiness of varying degree according to the amount of blood which has escaped. Then a colour due to hæmoglobin, varying from canary-yellow to reddish-brown, appears and persists for about three weeks. Thereafter the only guide in the spinal fluid is a probable persistence for some time of a slightly raised cell count and protein content.

J. D. ROLLESTON.

**BILATERAL HÆMORRHAGIC SOFTENING OF THE RADIA-**  
(385) **TIONS OF THE CORPUS CALLOSUM.** (*Rammollimento emorragico bilaterale delle radiazioni callose.*) G. MINGAZZINI (of Rome), *Riv. di Pat. nerv. e ment.*, Feb. 1912.

THE patient, a man of 65, alcoholic but not syphilitic, eight months before death became peculiarly irritable and occasionally violent, his memory became defective, and his behaviour showed a loss of the sense of shame. He later passed into a state of confused excitement, and had two convulsive attacks, followed by a stuporous condition of varying depth which lasted up to the patient's death. The neurological picture consisted of deviation of head and eyes to the left, contracture of the neck, hypotonia of the inferior facial, spasticity of all the limbs, more accentuated on the left side, deep reflexes active, negative cerebro-spinal fluid. The autopsy disclosed two large, rust-coloured foci of a softening of arteriosclerotic origin, which destroyed almost completely on both sides the radiations of the corpus callosum, and on the right extended for a certain distance into the centrum semi-ovale.

C. MACFIE CAMPBELL.

**OCCLUSION OF THE POSTERIOR INFERIOR CEREBELLAR (386) ARTERY.** (Report of case). G. W. ROBINSON, *Journ. Amer. Med. Assoc.*, 1913, lxi., July 19, p. 179.

AN account of a case in a man, aged 45, a farmer by occupation, together with a brief note on the anatomical structures involved and on the symptomatology of such lesions.

A. NINIAN BRUCE.

**A CASE OF FACIO-HYPOGLOSSAL ANASTOMOSIS.** EDMUND C. (387) BEVERS, *Lancet*, 1913, May 24, p. 1450.

A DESCRIPTION of a successful case, with two photographs, of a facio-hypoglossal anastomosis in a girl, aged 14, who developed a complete paralysis of the right side of the face after a radical mastoid operation for acute middle ear suppuration.

A. NINIAN BRUCE.

**MITRAL DWARFISM.** F. PARKES WEBER, *Brit. Jour. Child. Dis.*, 1913, (388) x., p. 203.

THE patient was a girl, aged 15, though her size was that of a child of 10 years. She was 50 in. (127 cm.) in height, and weighed 54 lbs. (24½ kgm.). The heart showed evidence of mitral obstruction and incompetence. Mentally the child appeared normal. Von Pirquet's and Wassermann's reactions were negative. There was no family history of dwarfism nor infantilism. The cardiac disease was probably of rheumatic origin, and had commenced at a relatively early period of extra-uterine life. Mitral obstruction was a more important factor than incompetence in the production of the dwarfism, which the writer regards as a conservative hypoplasia—"Nature's attempt to limit the growth of the patient in accordance with the limited blood supply."

J. D. ROLLESTON.

**ACROMEGALY WITH LOCALISED MUSCULAR ATROPHY** (389) JULIAN LOUDON, *Canad. Pract. and Review*, April 1913.

A DESCRIPTION, without illustrations, of a case of acromegaly combined with progressive muscular atrophy in a man, aged 37.

A. NINIAN BRUCE.

**TUMOUR OF THE HYPOPHYSIS IN A CASE OF ACROMEGALY.** (390) JULIUS GRINKER, *Journ. Amer. Med. Assoc.*, 1913, lxi., July 26, p. 235.

THE patient was a man, unmarried, who had suffered from acromegaly for about fifteen years. The symptoms followed a

fright and an infected vaccination wound on the arm, and were accompanied by attacks of *petit mal*; later there were added somnolency, cephalalgias, and change of character. Though presenting the classic picture of acromegaly the patient never suffered from any of the usual visual disorders of this disease, such as hemiopia and central scotoma. In the course of time, however, attacks of major epilepsy and uncinata fits supervened and the patient died in coma.

The post-mortem examination showed a large adenoma, which had pushed up the optic chiasma, extended into the lateral ventricles and incidentally caused a bilateral hydrocephalus, more marked on the left side. Complete absence of the thyroid gland is also recorded.

A. NINIAN BRUCE.

**I. FATAL PELLAGRA IN TWO ENGLISH BOYS.** CHARLES R. BOX, (391) *Brit. Med. Journ.*, 1913, July 5, p. 2.

THE first case, a boy aged 8, "fainted" while playing cricket three months before coming under observation. Two months later he had a fit, his body becoming rigid, but consciousness was not lost. His walk became ataxic and spastic, his speech indistinct, and a coarse nystagmus was present. The dermatitis on his face and hands resembled acute sunburn, and is clearly shown in a coloured plate. The cerebro-spinal fluid was normal. He later developed slight delusions. An acute suppurative balanitis appeared a fortnight before death.

At the autopsy the brain and cord appeared healthy on their removal, and were examined by Dr Mott (*v. infra*).

The second case, a brother of the first, was only under observation for a fortnight. He had been weak on his legs for about six years, and dull and backward in his studies. The eruption appeared on his face, neck, and hands. He grew gradually worse, and died in January 1911, the nature of the disease being not then suspected.

A third member of this family, a boy of 7, was also attacked by the disease.

A. NINIAN BRUCE.

**II. THE HISTOLOGICAL CHANGES IN THE NERVOUS SYSTEM** (392) **OF DR BOX'S CASE OF PELLAGRA, COMPARED WITH CHANGES FOUND IN A CASE OF PELLAGRA DYING IN THE ABASSIEH ASYLUM, CAIRO.** F. W. MOTT, *Brit. Med. Journ.*, 1913, July 5, p. 4.

DIFFUSE and scattered degenerated fibres were found throughout the white matter of the spinal cord, but more marked in the postero-lateral and postero-median columns; scattered degenerated

fibres were also found in the sciatic nerve. The tracts of Flechsig and Gowers, the column of Goll, and the crossed pyramidal tract show a general diffuse sclerosis.

Microscopically no evidence of meningeal or perivascular infiltration with lymphocytes, or plasma cells, or polymorphs was found. The absence of chronic meningo-encephalitis and meningo-myelitis contraindicates the protozoal theory of the disease, although it does not disprove it. The nerve cells showed a marked chromatolysis, swelling of the cell, and disappearance of the Nissl granules, except at the periphery, and frequent eccentric position of the nucleus. The changes were seen in the Betz cells, in the Purkinje cells, and in the cells of Clarke's column, and rather indicate a chronic toxæmic condition.

Comparison of the above changes found in Dr Box's case with those of a pellagrous patient who died at the Abassieh Asylum, Cairo, and whose case is here reported, showed no essential difference.

A. NINIAN BRUCE.

**III. THE NATURAL HISTORY OF PELLAGRA. WITH AN**  
(393) **ACCOUNT OF TWO NEW CASES IN ENGLAND.** LOUIS  
W. SAMBON, *Brit. Med. Journ.*, 1913, July 5, p. 5.

A CASE of pellagra is here described in a man, aged 36, born at Beaulieu. He presented a typical rash with depression, tremor, and vertigo. He had never eaten maize, but close to where he lives there are streams harbouring *Simuliidæ*.

A second case in a boy, aged 7, is also described.

Pellagra is essentially an endemic disease. It has scattered strictly limited stations within which it is rampant, and affects newcomers; outside these stations it cannot be contracted. The most striking feature of these stations is a swiftly flowing stream. The author thinks that pellagra is an insect-borne disease, and that the *Simuliidæ* appear to coincide geographically, topographically, and seasonably with the disease, together with some blood-sucking midges such as *Leptoconops*. A description, with three illustrations of *Simulium*, is given, and a number of interesting points in connection with the disease abroad, which seem to strongly support the above view, and the paper concludes with a short description of the disease as found in foreign countries.

A. NINIAN BRUCE.

**PELLAGRA IN GREAT BRITAIN: three new indigenous cases.**  
(394) LOUIS W. SAMBON, *Brit. Med. Journ.*, 1913, July 19, p. 119.

THE first case occurred in a girl, aged 7 years, who had never eaten any maize. She was perfectly well until 4 years of age,

when nocturnal enuresis developed and "eczema" on the hands and face in spring, lasting all summer, and disappearing in the winter. Her speech was affected, her mental standard was low. Convulsive fits became more and more frequent, and she died after a more than usually severe attack.

The second case was in a woman, about 65 years of age, who suffered from an erythema-like dermatitis on the backs of both wrists and hands, brownish-red in colour, and coming on in spring and autumn. Apart from a little depression there were no nervous symptoms.

The third case was in a young woman suffering from typhoid pellagra with vivid hallucinations, tremors, acute confusional insanity, coma vigil, and a pellagrous dermatitis on the face and hands.

Notes on two other cases with marked nervous symptoms are also given, one in a woman aged 74, and the other in a woman aged 37.

A. NINIAN BRUCE.

#### **PELLAGRA IN GREAT BRITAIN. NOTES OF SOME FURTHER**

(395) **CASES.** LOUIS W. SAMBON, *Brit. Med. Journ.*, 1913, Aug. 9, p. 297.

SEVERAL more cases are here recorded, one of which in a girl, nearly 17 years of age, is reported at considerable length. The nervous and mental symptoms were both well marked, and the distribution of the rash was typical.

A. NINIAN BRUCE.

#### **A CASE OF PELLAGRA IN ENGLAND. PROBABLY CON-**

(396) **TRACTED IN SCOTLAND.** J. A. B. HAMMOND, *Brit. Med. Journ.*, 1913, July 5, p. 12.

A YOUNG woman, aged 33, who had always led an active outdoor life, began to suffer from headache, lassitude, abdominal pain and tenderness over the right iliac fossa. Removal of the appendix caused a temporary improvement, after which the symptoms became much worse. An exploratory laparotomy revealed nothing. In the late spring, when she was taken into the garden, a dermatitis appeared over the hands, wrists, and face. She grew rapidly worse, became extremely emaciated, the mouth acutely ulcerated, and mental symptoms set in. The prostration and cachexia continued, and she finally died in April 1913. There was no history of eating maize, but she was a frequent victim to insect bites.

A. NINIAN BRUCE.

**SOME HÆMATOLOGICAL FINDINGS IN PELLAGRA.** O. S. HILL-  
(397) *MAN*, *Amer. Journ. Med. Sc.*, 1913, cxlv., April.

THIS is the first of a series of reports of work performed under the auspices of the Thompson-M'Fadden Pellagra Commission of the New York Post-Graduate Medical School.

The hæmoglobin content, the number of red and white cells per cubic millimetre, the differential leucocyte count, and the general morphologic characteristics of the blood were determined. A few observations were also made on the coagulation time.

The patients were divided into two groups. Under group A were included hospital cases, who received no medicine, and were allowed a liberal diet. Under group B were included those cases in which only differential leucocyte counts were done.

In group A the hæmoglobin varied from 58 to 107 per cent., the average being 83 per cent. The average red-cell count was 4,758,000 per c.mm. The colour index was 1 or plus 1 in twelve determinations, and in twenty instances it was under 1, the lowest being 0.6; the average index was 0.8.

The average leucocyte count was 10.403 per c.mm.

The differential leucocyte count revealed an absolute polynucleosis in those cases associated with a leucocytosis of over 10,000, except in one instance. The average total lymphocytosis was 33.99 per cent., the average large mono-nuclear count was 2.59 per cent., the average transitional cell count was 1.5 per cent., and the average eosinophile count was 2.73 per cent.

The differential leucocyte count on a series of slides taken from thirty-seven cases at their homes in South Carolina showed no variation from those recorded. The coagulation time of the blood determined in three cases was within normal range.

D. K. HENDERSON.

**METABOLISM IN PELLAGRA.** V. C. MYERS and M. S. FINE, *Amer.*  
(398) *Journ. Med. Sc.*, 1913, cxlv., May.

THIS paper forms a part of the work performed by the Thompson-M'Fadden Pellagra Commission of the New York Post-Graduate Medical School.

A study of the metabolism in pellagra is of interest as an aid to the interpretation of the gastro-intestinal symptoms generally observed; in connection with the maize theory of the etiology of the disease, and because of the resemblance to beri-beri, in which the etiologic factor appears to be an inadequate dietary.

The methods of examination employed are thoroughly detailed, and the results of this study are summarised as follows:—

The elimination of mineral and nitrogenous constituents in the

urine is such as would be anticipated under the dietary and physical conditions of the individual. A lower physiologic efficiency is indicated by the low creatin in coefficients, and the elimination of small amounts of creatin in the urine.

Anacidity is common in pellagra, as it was found in eight out of fourteen cases. It is generally associated with an entire absence of pepsin, or with pepsin in very minute quantities.

A marked indicanuria is present, which is excessive in cases with gastric inefficiency. The quantities eliminated are much higher where anacidity exists, and they furthermore hold a higher ratio to the inorganic sulphates.

The faeces contain decidedly abnormal amounts of indol and skatol, especially the latter.

The presence of excessive amounts of indican in the urine, associated with a high elimination of ethereal sulphates, when considered in connection with the abnormal amounts of indol and skatol in the faeces, points to some unusual bacterial conditions in the intestine.

D. K. HENDERSON.

**THE RELATION OF SYPHILIS TO PROGRESSIVE MUSCULAR (399) DYSTROPHY.** W. B. CADWALADER and E. P. CORSON-WHITE, *Med. Record*, 1913, i., p. 1033.

THE writers investigated twenty-seven cases with the Wassermann and Noguchi reactions. Seven were positive, in three one of the parents also was positive, and one of them had facial paralysis, which might have been due to syphilis. Unaffected brothers or sisters gave positive reactions in three families. Miscarriages had occurred in five families. Whether hereditary syphilis is necessary for the development of progressive muscular dystrophy, or whether there was a mere coincidence in these cases of two distinct diseases, is left undecided.

J. D. ROLLESTON.

**A CASE OF GRAVES' DISEASE WITH SCLERODERMIA AND A (400) POSITIVE WASSERMANN REACTION, TREATED WITH SALVARSAN.** H. F. L. ZIEGEL, *Med. Record*, 1913, i., p. 1124.

THE patient was a married woman, aged 28, with no history nor clinical evidence of syphilis. Wassermann negative in son aged 7 years and husband. Administration of salvarsan and other forms of arsenic was followed by a negative reaction, marked improvement in the sclerodermia, diminution of the thyroid swelling, and disappearance of the nervous symptoms and tachycardia.

J. D. ROLLESTON.

**THE DANGERS AND COMPLICATIONS OF SALVARSAN TREAT-**  
(401) **MENT.** HUGH WANSEY BAYLY, *Lancet*, 1913, May 24, p. 1443.

THE author considers that:—

1. The risk of death is so small that if due care is taken in preparation of the patient, and no errors are made in preparation of the solution of the drug, technique of administration, interval between injections, or subsequent treatment, fear of death cannot justifiably be advanced as a reason for withholding salvarsan treatment.

2. The slight risk of serious complications or sequelæ is more than counterbalanced by the therapeutic results obtained.

3. All sufferers from syphilis, in whatever stage, and all cases of early parasyphilis should, as a matter of routine, be permitted the advantage of salvarsan treatment.

A. NINIAN BRUCE.

**THE EFFECT OF INTRAVENOUS INJECTION OF SALVARSAN**  
(402) **UPON THE KIDNEYS.** (Salvarsanets inverkan på njurarna vid intravenösa injektioner.) H. I. SCHLASBERG, *Nord. Med. Arkiv*, 1913, xlv. (Inre Med.), pp. 1-39.

THE author examined the urine of eighty patients after intravenous injection of salvarsan in order to determine if the subsequent excretion of arsenic by the kidneys leads to any inflammation of that organ. He found that this is almost always so, as large quantities of casts are to be found in the urine, without, however, bearing any definite relation to the actual amount of salvarsan injected. The casts usually appear on the day following the injection, and disappear from one to two weeks later. If the treatment be combined with mercury the number is greatly increased. He considers the condition is due to a pure toxic nephritis.

He also experimented upon rabbits, and found that an intravenous injection of 0.02 gr. of salvarsan per kilo. produced no clinical or anatomical changes in the kidneys, unless the dose were repeated when casts, but no albumen, appeared. 0.04 to 0.08 gr. per kilo. produced both casts and albumen, with marked fatty degeneration of the renal epithelium.

A. NINIAN BRUCE.

**CONCERNING AGGLUTININS FOR TREPONEMA PALLIDUM.**  
(403) JOHN A. KOLMER, *Journ. Exp. Med.*, 1913, xviii., July, p. 18.

THERE is no demonstrable amount of agglutinin for *Treponema pallidum* (Noguchi) in normal human and normal rabbit serum in dilutions as low as 1 : 20. Agglutinins for *Treponema pallidum*



are readily produced in young rabbits by the administration of pure cultures of living spirochetes. There is no appreciable amount of agglutinin for *Treponema pallidum* culture used in the sera of secondary and tertiary syphilis, or in the cerebro-spinal fluid of tertiary syphilis in dilutions of 1 : 20 to 1 : 640.

A. NINIAN BRUCE.

**A STUDY OF THE ADDITION OF CHOLESTERIN TO THE ALCOHOLIC EXTRACTS OF TISSUES USED FOR ANTIGENS IN THE WASSERMANN REACTION.** I. C. WALKER and HOMER F. SWIFT, *Journ. Exp. Med.*, 1913, xviii., July, p. 75.

THE addition of cholesterin to an alcoholic extract of heart or foetal liver increases the antigenic value of the extracts in the Wassermann reaction. The optimum amount of cholesterin to be added to heart extract or foetal liver extract was found to be 0.4 per cent. Cholesterin-heart extracts are superior to cholesterin-liver extracts and to alcoholic extracts of syphilitic livers, as well as to ether extracts of dried hearts. Cholesterin-heart extracts prepared from different human hearts are practically equal in anticomplementary antigenic value. Similar extracts prepared from guinea pig hearts have the same antigenic value as those prepared from human hearts. Both the human heart and the guinea pig heart extracts are superior to beef heart extract when the same amount of cholesterin is added to each of the extracts. In testing blood serum for diagnostic purposes, it is not safe to use more than one-fourth of the anticomplementary dose of the 0.4 per cent. cholesterin-heart extract. In the work here presented, this consisted of a one in ten emulsions. In testing cerebro-spinal fluids, one in ten emulsions give slightly better reactions with smaller quantities of the fluid than do one in six emulsions. Because of the simple preparation, the superior antigenic property, and the constant antigen value of cholesterin-heart extracts prepared from human hearts, the authors agree with M'Intosh and Fildes that this form of extract fulfils the requirements of a standard antigen.

A. NINIAN BRUCE.

**A STUDY OF COMPLEMENT FIXATION IN SYPHILIS WITH TREPONEMA ANTIGENS.** J. A. KOLMER, W. W. WILLIAMS, and E. E. LAUBAUGH, *Journ. Med. Research*, 1913, xxviii., July, p. 345.

1. Serums of normal persons, and normal rabbits, and of persons suffering from non-syphilitic diseases with negative Wassermann reactions, do not contain substances capable of

fixing complement with pallidum antigens. About 50 per cent. of serums from persons in all stages of syphilis, and giving positive Wassermann reactions and luetic histories reacted negatively with the pallidum antigens. The reactions with the pallidum antigens are weak and too inconstant to be of routine practical value.

2. Serums of rabbits immunised with pure cultures of *Treponema pallidum* yielded strong reactions with the pallidum antigens. As controlled by the examination of one hundred normal rabbits, these serums also give positive reactions with stock lipoidal extracts.

3. Many of the human serums and all the rabbit immune serums were likewise tested with control antigens of sterile culture media, pure washed cultures of typhoid and cholera bacteria, as well as cultures of these organisms in the same culture media as used in the cultivation of *Treponema pallidum*. With the human serums a few doubtful reactions were obtained with the antigens of sterile media, and more marked reactions with the typhoid and cholera culture media antigens. The rabbit immune serums not only reacted strongly with these antigens, but likewise yielded weak reactions with antigens of washed typhoid and cholera bacteria. From the fact that a lipoid was demonstrated in these antigens, it may be that the non-specific reactions were due to the usual union of lipoid and lipoidophilic antibody, although the authors are unable to explain at present why this is especially true with the rabbit immune serums.

4. From the fact that the reactions with alcoholic extracts of pure washed treponema were uniformly negative, it is apparent that the antigenic principle of the treponema is not readily abstractable in alcohol, the aqueous extracts being preferable in complement fixation reactions.

A. NINIAN BRUCE.

**CONCERNING THE WASSERMANN REACTION WITH NORMAL (406) RABBIT SERUM.** J. A. KOLMER and A. J. CASSELMAN, *Journ. Med. Research*, 1913, xxviii., July, p. 374.

A PERCENTAGE of serums of normal rabbits yielded positive complement fixation reactions with lipoidal extracts. With aqueous and alcoholic extracts of pallidum as antigen fixation did not occur. With acetone extracts of syphilitic liver no fixation was found when using .05 c.c. and .1 c.c. of serum; with .2 c.c. serum fixation occurs in 10 per cent., and with .4 c.c. in 31.1 per cent. of normal rabbit serums. With alcoholic extracts of syphilitic liver fixation did not occur with .05 c.c. serum; when using .1 c.c. fixation occurred in 13.3 per cent.; with .2 c.c. in 20 per cent.; and with .4 c.c. in 27.5 per cent. of normal serums. With extracts of

the acetone insoluble lipoid fraction fixation did not occur with .05 c.c. and .1 c.c. of serum; with .2 c.c. fixation occurred in 33.1 per cent., and with .4 c.c. in 55.7 per cent. of normal rabbit serums. An alcoholic extract of beef, heart reinforced with cholesterin, showed the highest per cent. of positive reactions. With .05 c.c. serum fixation did not occur; with .1 c.c. fixation occurred in 20 per cent.; with .2 c.c. in 40 per cent.; and with .4 c.c. in 56.8 per cent. of normal rabbit serums. The occurrence of positive complement fixation reactions with normal rabbit serums and lipoidal extracts bears no relation to coccidiosis. While the cause of this phenomenon is as yet unexplained, it is probably due to the presence in rabbit serum of a lipoidophilic substance with affinity for certain lipoids or lipoidal substances.

A. NINIAN BRUCE.

**THE BLOOD AND THE CEREBRO-SPINAL FLUID IN MUMPS.**

(407) ANTHONY FIELING, *Lancet*, 1913, July 12, p. 71.

THE author finds that in mumps the blood shows definitely a slight increase in the total number of leucocytes, and a relative and absolute lymphocytosis, which is present on the first day, and persists for at least 14 days.

Also a lymphocytosis of the cerebro-spinal fluid occurs when the disease is complicated by meningitis or by lesions affecting the cranial nerves; and a lymphocytosis has also been found in cases of mumps which have presented no clear clinical symptoms of any organic lesion of the nervous system.

A. NINIAN BRUCE.

**THE CROTALIN TREATMENT OF EPILEPSY.** RALPH H. SPANGLER,

(408) *Epilepsia*, 1913, iv., Juli, p. 307.

THE crotalin solution used was made from the dried, yellowish, crystal-like scales of the evaporated venom of the *Crotalus horridus*, by dissolving the crystals in glycerine and sterile water with a few drops of tricresol. The solution is then put into sterilised ampules containing 1 c.c. of whatever strength is desired.

The author considers that the venom treatment is indicated in many of the essential cases of epilepsy. Not only are the virulence and number of epileptic fits favourably influenced, but the excitability of the nervous system is modified, and the general health of the patients, their mental faculties and metabolism in every respect, are considerably improved. The quality of the blood, and possibly its chemical composition, seem to be affected by the

injection of the venom. As to the exact effect it has on the coagulability of the blood, further observation is necessary. There is no danger in the use of crotalin if the usual precautions be taken.

A. NINIAN BRUCE.

**A CASE OF TETANUS TREATED WITH INTRASPINAL INJECTIONS OF MAGNESIUM SULPHATE.** H. LETHEBY TIDY, *Brit. Med. Journ.*, 1913, May 24, p. 1104.

A BOY, aged 8, developed tetanus three to four weeks after two slight cuts to his head and chin. There was a marked risus sardonicus, opisthotonus, and great pain. Ten c.c. of cerebro-spinal fluid were removed by lumbar puncture under great tension, and 3 c.c. of sterilised 25 per cent. magnesium sulphate solution injected. The spasms then ceased. The injection was repeated after two days, and again four days still later, each time on account of increase of the rigidity being noticed; 10 c.c. of anti-tetanic serum were injected after other three days, and he made a good recovery.

For an adult a dose of 6 c.c. of a 25 per cent. solution in distilled water may be given. This contains about  $1\frac{1}{2}$  grams (about 22 grains) of magnesium sulphate (*cf. Review*, 1912, x., p. 92).

A. NINIAN BRUCE.

**POLYNEURITIS FOLLOWING A PHLEGMON OF THE RIGHT INDEX.** (Polynévrite consécutive à un phlegmon de l'index droit.) SAVY and MAZEL, *Lyon méd.*, 1913, cxx., p. 1151.

A WOMAN, aged 46, ran a splinter into her finger in March, and developed a whitlow which was complicated by cedema of the right upper arm. After a free incision the finger healed in three weeks, but weakness of the limbs ensued. On admission to hospital in May she had almost complete paralysis of all four limbs, paresis of the dorso-lumbar muscles, difficulty in swallowing, and diplopia, but no subjective disturbance of sensation, and no R.D. Cerebro-spinal fluid normal. Subsequently severe pain developed in the limbs, but by September complete recovery took place. No bacteriological examination had been made of the pus from the finger, so the cause of the polyneuritis was uncertain.

The patient had had no sign of diphtheritic angina or coryza, no specific antecedents nor any traces of diabetes, nor alcoholism.

(The possibility of the phlegmon being an instance of purely cutaneous diphtheria is not mentioned.) J. D. ROLLESTON.

**A CASE OF EVULSION OF THE OPTIC NERVE.** (Ein Fall von (411) *Evulsio nervi optici*.) A. NATANSON, *Klin. Monatsbl. f. Augenheilk.*, 1912, I., August, S. 220.

A YOUNG man was struck on the left eye by the point of a stick. There was severe pain at the time, soon followed by swelling. Two weeks afterwards when the eye was examined, it was found to be blind with the pupil dilated, and unresponding to light. The media were clear, and in place of the usual appearance of the optic disc there was an oval-shaped hole about 3 mm. deep. This hole was surrounded by an oval area, devoid of retina and surrounded by hæmorrhages, beyond which the retinal vessels could be seen. The macular area exhibited a milky dimness.

The diagnosis was obviously rupture of the nerve in the neighbourhood of the lamina cribrosa produced by the point of the stick pushing the optic nerve backwards, while at the same time forcing the eyeball to the front of the orbit.

H. M. TRAQUAIR.

**CONTRIBUTION TO OUR KNOWLEDGE OF TUBERCULOUS**  
(412) **CHANGES IN THE RETINA.** (Beiträge zur Kenntnis der tuberkulösen Veränderungen der Retina.) RADOS, *Klin. Monatsbl. f. Augenheilk.*, 1912, I., 2, S. 330.

TUBERCULOUS infection of the retina may begin in the iris and ciliary body, and spread backwards or may spread forwards from the optic nerve. The case under review occurred in a boy of 10 years, who died a year afterwards of tuberculous meningitis, and belongs to the first group. A minute description of the microscopic appearances is given, special attention being drawn to the unaffected condition of the choroid and the presence of at least one typical tubercle as well as groups of small submiliary tubercles in the nerve fibre layer of the retina. Bacilli were not found.

Tuberculous changes in the retina, especially with giant cells, are extremely rare. The paper closes with an account of hitherto described cases.

H. M. TRAQUAIR.

**PARESIS OF THE OCULOMOTOR NERVE WITH ABNORMAL**  
(413) **CYCLIC INNERVATION OF THE INNER BRANCHES.**  
(Okulomotoriuslähmung mit abnormal zyklischer Innervation der inneren Aeste.) SALUS, *Klin. Monatsbl. f. Augenheilk.*, 1912, I., 2, S. 66.

In this case the right eye presented usually the ordinary picture of third nerve paralysis. Suddenly, however, the upper lid would begin to rise and the pupil to contract. After from ten to thirty seconds the eye returned to its original state. The

case is discussed at length by the author, who suggests in explanation of the phenomena an early or congenital lesion of the third nerve near the peduncle, followed by regeneration in such a way that the fibres for the outer muscles of the eye became continuous with those for the intraocular muscles. Thus stimuli intended for the external muscles reached the iris and ciliary muscle.

H. M. TRAQUAIR.

**CLINICAL AND MICROSCOPICAL CONTRIBUTION TO SOLITARY TUBERCLE OF THE OPTIC NERVE-HEAD.** (414) **KLINISCHER UND MIKROSKOPISCHER BEITRAG ZUR SOLITÄRTUBERKULOSE DER PAPILLA NERVI OPTICI.** JAKOBS, *Klin. Monatsbl. f. Augenheilk.*, 1912, l., 2, S. 37.

THIS ocular condition, together with tuberculosis of the conjunctiva, occurred in the left eye of a patient who had tuberculosis dacryocystitis in his right eye and also laryngeal tubercle. The region of the optic disc was occupied by a greyish-white mass. The paper contains a detailed description of the microscopic changes found, special stress being laid on the presence of tuberculous foci spreading back along the nerve. While an expectant attitude is justifiable in solitary tubercle of other parts of the eyeball, an exception should be made in the case of optic nerve-head affection on account of the danger of backward extension, and the eye should be removed without delay. The conjunctival tuberculosis was cured by lactic acid.

H. M. TRAQUAIR.

**THE SOLUBILITY OF LEAD SALTS IN HUMAN GASTRIC JUICE** (415) **AND ITS BEARING ON THE HYGIENE OF THE LEAD INDUSTRIES.** A. J. CARLSON and A. WOELFEL, *Journ. Amer. Med. Assoc.*, 1913, lxi., July 19, p. 181.

LEAD may be absorbed by the skin, the lungs, and the digestive tract. Under ordinary conditions absorption by the skin is very slight. Lead poisoning occurs in industries in which no lead dusts are produced. And since lead dust in the respired air increases the chances of lead dust entering the stomach, it is clear that the digestive tract is in some cases the sole, and probably in all cases, the most important avenue of absorption of lead in industrial lead-poisoning. There is no evidence that lead salts can be absorbed, or act locally on the mucosa, except in solution.

The authors tested the solubility of lead salts in human gastric juice obtained from a case of gastric fistula in a man of sixteen years' standing. They found that the carbonate of lead is much more soluble than the sulphate, and that the carbonate is also much more toxic than the sulphate, although both salts produce

acute lead poisoning when given in quantities of 0.1 gm. per kilo body weight daily. When milk and gastric juice are mixed in the proportions of 1:1, the hydrochloric acid of the gastric juice is so completely fixed that the mixture has virtually no solvent action on the lead salts. When gastric juice is present in excess the lead goes into solution in proportion to the excess of the gastric juice.

The authors therefore recommend that the state should aim at the elimination of the use of the carbonate in all industries in which this is possible, and that all lead workers should drink a glass of milk between meals in order to diminish the chances of any swallowed lead being dissolved by the free hydrochloric acid present.

A. NINIAN BRUCE.

### PSYCHIATRY.

**THE MORRISON LECTURES, 1913. GENERAL PARALYSIS OF (416) THE INSANE.** GEORGE M. ROBERTSON, *Journ. of Ment. Sc.*, 1913, lix., April, p. 185.

In this lecture the author gives a full account of the signs and symptoms, both mental and physical, of general paralysis. The uncertainty of diagnosis by clinical means is discussed, and a detailed account is given of new laboratory methods of diagnosis. These methods consist of six new serum and cerebro-spinal fluid tests, namely, the Wassermann reaction in the serum, the Wassermann reaction in the cerebro-spinal fluid, lymphocytosis, and the presence of globulin, albumen, and plasma cells in the cerebro-spinal fluid.

By means of the Wassermann reaction in the cerebro-spinal fluid, it is claimed that general paralysis can be differentiated from every other condition which simulates it, with the exception of tabes and syphilis of the nervous system. The other five tests assist very little in the differential diagnosis of these three conditions, which must therefore be made on clinical grounds.

Tabes with mental symptoms and cerebro-spinal syphilis with mental symptoms are next discussed, and the possibility of diagnosing early general paralysis before the onset of clinical symptoms by means of the laboratory methods is mentioned. The ætiology of the disease and its relations to syphilis are given at some length, and reference is made to Ford Robertson's diphtheroid bacillus, which the author admits is present in the blood or cerebro-spinal fluid in about 33 per cent. of cases of general paralysis, but he is unable to agree with Ford Robertson as to its significance. An account is given of the recent investigations of Noguchi, who demonstrated the spirochæta pallida in the brains of fourteen cases of general paralysis.

In the treatment of syphilis salvarsan is mentioned, and great stress is laid on the importance of obtaining a permanently negative Wassermann reaction. Although sufficient time has not yet elapsed to enable anyone to say that a complete cure of syphilis by salvarsan, with a permanently negative Wassermann reaction, will prevent the development of general paralysis, the author's opinion is that it is reasonable to think such might be the case.

The form of treatment adopted for general paralysis was as follows:—

1. *Intra-venous Injection of Salvarsan*.—0·3 to 0·6 grm. for a man, 0·2 to 0·3 grm. for a woman. The injection was repeated three or four times at intervals of a month.

2. *Intra-spinal Injection of Anti-Syphilitic Serum*.—To obtain this serum 20 or 30 c.c. of blood were withdrawn, with aseptic precautions, from the arm of a syphilitic patient, who had been treated three days previously with a full dose of salvarsan. This was allowed to clot, and cultures were made from the serum. The clotted blood was left on ice for twenty-four hours, and if the serum was sterile it was poured into a sterile flask with other sera, thus making a mixed serum. 10 to 15 c.c. of this mixed serum, twenty-four to forty-eight hours old, was used for an injection. Before the injection an amount of spinal fluid was withdrawn, equal to that of the serum which it was intended to inject. This serum is highly charged with syphilitic antibodies, and was injected intra-spinously in order to bring the remedy near the site of the disease.

3. *Intra-spinal Injection of Salvarsan Serum*.—This was obtained by drawing off some of the patient's own blood one hour after he had received an intra-venous injection of salvarsan. This method was only used on a few occasions, and was followed by a slight rise of temperature.

4. *Urotropine* in doses of gr. x. t.d.s.

*Calomel* was given twice weekly.

The results of the treatment on the whole were disappointing, but it seldom happened that the patient did not show slight improvement after the first or second injection. Twelve cases were treated. In five there was considerable excitement before treatment, and all of these were benefited and became calmer. Three recovered sufficiently to be discharged, one of these relapsing after six months, another meeting with a fatal accident, while the third remained well for a year. In more of the patients did the Wassermann reaction become negative, but in a number there was a distinct diminution of its intensity, which increased again later on. In three of the cases there was marked and lasting decrease



in the number of lymphocytes, and in three others it was slight and of a temporary nature. There was no change in the amount of globulin or albumen.

The author is of the opinion that the treatment was not vigorous enough either as regards the amount of salvarsan administered, the number of injections, or the rapidity with which these succeeded one another.

J. STANLEY HOPWOOD.

**THE TRANSMISSION OF TREPONEMA PALLIDUM FROM THE  
(417) BRAINS OF PARETICS TO THE RABBIT.** HIDEYO NOGUCHI,  
*Journ. Amer. Med. Assoc.*, 1913, lxi, July 12, p. 85.

NOGUCHI has now found the spirochetes in 36 of 130 additional brains (*v. Review*, 1913, xi. p. 174), from which sections stained by the modified Levaditi method were examined. Thus, in 200 cases of paresis so far studied, the *pallidum* was found in 48, *i.e.*, nearly 25 per cent. He has also found it in the posterior columns of the cord in 1 of 12 cases of tabes dorsalis.

Forty-two rabbits were injected intratesticularly with an emulsion of the fresh brain obtained from a paretic individual. Two later developed syphilitic scleroses containing *treponema pallidum* in their testes, the one taking 92 days to develop, and the other 105.

A. NINIAN BRUCE.

**THE PRE-SENILE PSYCHOSES.** W. L. TREADWAY, *Journ. Nerv.  
(418) and Ment. Dis.*, 1913, xl, June, p. 375.

A SOMEWHAT heterogeneous group of seven cases without autopsy reports.

D. K. HENDERSON.

**THE PROBLEM OF THE ALIEN INSANE.** S. L. DOWES, *Amer.  
(419) Journ. Med. Sc.*, 1913, cxlv., No. 5, May.

THE inadequacy of the Federal laws, both as to the admission of immigrants and the deportation of insane aliens, is considered.

D. K. HENDERSON.

**SOME CASES OF MENTAL DEFICIENCY.** E. BELLINGHAM SMITH,  
(420) *Brit. Journ. Child. Dis.*, 1913, x., p. 241.

A CLINICAL lecture illustrated by cases of sense deprivation, cretinism, mongolism, microcephaly, paralytic idiocy, and simple amentia.

J. D. ROLLESTON.

**A CASE OF ALZHEIMER'S DISEASE WITH UNUSUAL NEURO-LOGICAL DISTURBANCES.** A. M. BARRETT, *Journ. Nerv. and Ment. Dis.*, 1913, xl, June, p. 361.

THE case of a married woman who, at the age of 33, became mentally confused. Two years later she showed an unsteady gait, and a constant coarse tremor of both legs even when lying quietly in bed. There were frequent jerking movements of the legs and arms, and twitching movements of individual muscles. The speech was indistinct, stammering, and at times explosive. The tendon reflexes were much exaggerated, the right arm was spastic, and Babinski's sign was present on the right side.

She showed a variable emotional condition, laughing and crying without reason. She wandered aimlessly about, and only rarely comprehended what was said to her.

During her two years' residence in the hospital she had a number of convulsive seizures, accompanied by loss of consciousness, showed extreme atrophy of the leg muscles, and latterly the Babinski reflex could not be elicited. She died on 31st October 1910.

Grossly the cerebrum and cerebellum were found to show marked atrophy. Histologically all regions of the cortex showed numerous plaques and the peculiar neuro-fibril alterations described by Alzheimer and others as characteristic for this disease. A very striking degeneration was also found in the pyramidal tract traceable from the peduncles into the lower sacral regions of the cord.

The interesting features in the case are the early age at which the disease occurred, and the unusual and dominating character of the neurological disturbances. The case shows that so far as age is concerned Alzheimer's disease is not confined to pre-senile years.

D. K. HENDERSON.

## Review.

**ACROMEGALY. A Personal Experience.** LEONARD PORTAL MARK, (422) M.D. Demy 8vo., pp. 160 with 11 plates. Baillière, Tindall & Cox, London. 1912. Price 7s. 6d. net.

THE author of this book is a medical man, who himself suffered from the disease, and its interest lies in the fact that we have here a record of the feelings and thoughts and mode of life as described by a sufferer who had the necessary medical knowledge to understand and interpret the different symptoms as they arose.

A special chapter is devoted to each symptom which is discussed in detail, and the book finishes with some notes on the skull by Prof. Keith.

The author has suffered from the disease for about thirty-two years, the first symptoms—"queer feelings in his left ear"—appearing when he was twenty-four years of age, and seven years before the disease was first recognised by Pierre Marie. A year later he developed photophobia and drowsiness. His general health then became affected, and curious feverish attacks developed, followed by severe headache and faceache, and inability to resist cold and exposure. Then post-nasal catarrh and rhinorrhoea became marked, and indigestion from the advancement of the lower jaw preventing the "bite" of the teeth. Great sense of fatigue and difficulty in balancing on cycling were also observed. Acromegaly was diagnosed by his friends when he was 37 from the advancement of his lower jaw. The neuralgia, asthenopia, and nasal catarrh all became worse, and the tongue and heart hypertrophied. The queer feelings in his head became more persistent, and developed into attacks of what he describes as "the acromegalic state." In spite of this he continued at work, and at the age of 49 he was "spotted" in a crowd in Paris by Pierre Marie as a "typical acromegalic," but it was not until the following year that he himself suddenly discovered that his symptoms were due to acromegaly, a fact which was later confirmed by Pierre Marie.

A. NINIAN BRUCE.

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# **Review** **of** **Neurology and Psychiatry**

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## **Original Articles**

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### **REMARKS UPON THE IRREGULAR AND UNUSUAL TYPES OF FAMILIAL PERIODIC PARALYSIS AND CONDITIONS SIMULATING THE SAME, WITH A PRELIMINARY REPORT UPON A NEW SUB-TYPE OF THIS PALSY.<sup>1</sup>**

By L. PIERCE CLARK, M.D., New York,  
Neurologist, Randall's Island Hospital ; Consulting Neurologist, Manhattan  
State Hospital ; Chief Consultant, Letchworth Village.

IN May of last year the author reported before the American Neurological Association an instance of intermittent familial paralysis which differed notably from the usual type.

Assuming that most physicians are familiar with the classical type, we find indications, from studying individual cases, that the differences within the classical limit are chiefly those of degree. There are certain mild, abortive cases in which, for example, the electrical phenomena are much less pronounced than in the general run of cases. This variation is probably individual only, not familial, which leads us to state that sporadic cases must also be included in seeking for analogies to our familial example. The well-known family described by Holtzapple differs in a number of respects from the classical type, but this difference does not show much parallelism with our family. It is notably severe, some cases having ended fatally; the familial incidence was a large one, and a migrainous equivalent was very pronounced in the family.

<sup>1</sup> Read at the Thirty-eighth Annual Meeting of the American Neurological Association, 11th May 1912, Boston, Mass.

This leads us to the decision of briefly reviewing various anomalous conditions reported from time to time, which, while no one would place them outright beside familial periodic palsy as group members of one disease, may at least have one or more components in common with the latter.<sup>1</sup>

<sup>1</sup> Lest many are not so fully acquainted with Holtzapple's important work upon his sub-type as that of Goldflam's, which may be called the classic type of this affection, I shall undertake to give as briefly as possible the main facts in Holtzapple's publication (*Jour. Amer. Med. Assoc.*, 1905).

Holtzapple has had twenty-two years' continuous experience studying a family with periodic paralysis. Hitherto familial periodic paralysis was not regarded as fatal (one doubtful case by Schachnowitsch, 1882, an exception); the author has had six deaths in this family in the midst of an attack, one in Holtzapple's presence. Many members of this family have suffered from attacks of periodic sick headache, which appears to be an equivalent and due to a common cause.

The paralysis is a flaccid motor one in type, and affects all voluntary muscles save those of the face, eyes, tongue, speech and deglutition, and sphincters of rectum and bladder. Periodicity is evident early in the disease, but after some years the interval varies. Paralysis may be partial or complete, localised or general, and many forms of fluctuation are seen—partial paralysis early in the day, total paralysis at night; one side totally and the other partially paralysed, &c., &c.

There may be remissions, followed by more severe phenomena of paralysis. In the most complete form the subject is quite helpless. It is in these severe expressions that certain muscles may be dangerously involved, as those of respiration and deglutition. The muscles first attacked are usually those of the lower extremities, but at times the muscles of the upper extremities or neck may lead. Ordinary sensorial disturbances are absent, save rarely formication and numbness in the paralysed area. But there is a heaviness, a tired feeling, very oppressive, and in which change of posture gives relief.

In complete paralysis reflexes and faradic excitability are abolished.

Some patients can foretell their attacks—the heavy, tired feeling, numbness and formication, tendency to stretch. These symptoms usually appear toward evening, and are often accompanied by a ravenous hunger. Over-indulgence in rich food may itself be accused of causing the crisis. Dietetic excesses without ravenous appetite also provoke attacks at times. Some patients may go to bed in the best of health and awaken paralysed in part, the symptoms growing worse. Abortive attacks are seen as follows: Patients waken heavy, tired, and drowsy. There is a certain amount of weakness and ataxia, interfering with the finer movements. These spells may last for several hours only, or up to three days. They may pass off without a true attack, but they may be aggravated. Recovery from paralytic attacks is usually very sudden. As soon as a toe or finger can be moved the attack appears to be over. In some cases an attack ends with vomiting or diarrhoea. Some patients will have it that they hasten the departure of their attacks by making exertions.

There are absolutely no psychic symptoms during an attack, nor any affection of the cranial nerves or special senses. During a crisis the sphincters are not disturbed, unless the bladder is already over-extended. As a rule patients have no desire for food, and may even have nausea. They drink freely. The circula-

Thus a condition has recently been described by Meyer-Betz<sup>1</sup> as a "rare type of recurrent motor paralysis associated with hæmoglobinuria." It is not yet known whether or not the affection occurs in familial incidence; but it is known to attack horses, which would apparently eliminate a congenital factor, unless it can be shown that the animals also may exhibit the disease in families. Thus far no such transmission is apparent. At first the occurrence of hæmoglobin in the blood suggests paroxysmal hæmoglobinuria, but the two affections have nothing more in common than the mere condition of the urine.

Meyer-Betz's patient was a myasthenic boy. A state of extreme weakness was succeeded by contractures. The muscles are not themselves for some weeks, and in fact never do become so, for the boy is not strong and tires readily. The crises reappear, and the boy, who is now 13, has had many of them. The condition suggests slightly progressive muscular dystrophy, but he is thus far intact save for a slight contracture of the right Achilles. The question of a dystrophic component came up in connection with one of the author's cases, and in one of Bernhardt's.

This boy was studied as to his metabolism, with especial reference to the production of alimentary acetonuria. This would

tion is not disturbed as a rule—only once was there some evidence of respiratory failure. This might have been due to obstructed air passages from a cold, &c.

The disease usually appeared about puberty, and, as a rule, the patients remained in good health. The attacks of headache in the family did differ from ordinary hemicrania. They began earlier, and one patient in a long life developed no paralysis. A number had migraine up to 20 or 30 when it was replaced by paralysis, and in some the two affections alternated.

The total number of patients with paralysis was 17; with migraine, 19. 5 showed both affections. 14 had only paralysis and 13 only migraine. Total number of all cases, 32.

Of the 17 with periodic paralysis 7 have died, 1 with nephritis and 6 with the disease itself. Holtzapfle does not give details of the deaths. He regards the affection as a possible degenerative affection of the anterior horns (two patients became permanently paralysed?). Aside from this, he regards it as a vasomotor functional neurosis. The nearest disease in kinship is the combination of migraine with certain hemipareses. The exciting cause he assumes to be a toxin, and he examined 138 specimens of urine without coming to any conclusion. He used bromides, chiefly on the assumption that there was a vasomotor spasm of the anterior spinal arteries. This remedy seemed beyond doubt to give considerable relief.

<sup>1</sup> *Deutsch. Archiv. für Klin. Med.*, 1911, CI., p. 85.

amount to the production of acidosis. But while both acetone and oxybutyric acid appeared freely in the urine no muscular crisis supervened.

The association of motor inhibition with hæmoglobinuria in the horse is at least a strange coincidence. In the midst of health and after standing for some days in a stall, while in the midst of a short walk or trot, and even, it appears, without leaving the stall, the hind limbs become rigid and then paralysed. The animal falls, his limbs sweat and tremble. The crupper muscles are slightly swollen and tender, but the muscular reactions are normal. Hæmoglobinuria is present. If the attack is mild the horse recovers in three or four days, and becomes subject to repeated attacks. There is, however, a severe and fatal type of the creeping sort in which the affection spreads from one to another group of muscles.

Since vasomotor spasm has been so frequently accused of causing brief, transitory phenomena, occurring in succession, and with a familial tendency, it seems strange that the systemic muscles never seem to participate in vasomotor crises. W. Russell, in an article on motor paralysis due to angiospasm,<sup>1</sup> brings up the subject, but not with any reference to forms of myopathy. In feeble circulation the author has seen slight paresis of the arm and leg which disappeared on treatment. The paresis occurred in a series of crises, and the author accused contraction or obstruction of the cerebral arteries. Another periodic paresis, affecting the arm, is known to accompany migraine. Motor paresis may accompany atheroma and arterio-sclerosis in the aged, and occur in crises. The author also mentions transient hemiparesis associated with high blood pressure, appearing when the tension reached a certain point. As none of these conditions given by Russell bear the slightest resemblance to familial periodic paralysis, we may conclude that a vascular component does not figure in the genesis of the latter.

Batten<sup>2</sup> mentions a familial palsy in five children of one family. A periodicity is not present, and there is also a marked cerebellar component. Despite the continuous character of the muscular symptoms, there is no wasting and no dystrophy. There is, in fact, no tendency to advance. The electric reactions of the

<sup>1</sup> *Lancet*, 1912, ii., 1349.

<sup>2</sup> *Trans. Clin. Soc. London*, 1902, xxxv., p. 205.

muscles seem to be much like those in classic familial periodic paralysis.

Lenoble of Brest, who has had an opportunity to study numerous aberrant types of nervous affections, recently described a case of transient familial paraplegia occurring in three adults (father and two sons). All were attacked when young men. The type was spastic to the extent that it was painful, with heightened reflexes. Some atrophy resulted, but the affection appeared to be self-limited, for the father had long years ago recovered, and one son was improving. There were sensory disturbances.

An extraordinary type of momentary, repeated (or continuously recurring) amyotonia is related by Gonzales,<sup>1</sup> who, however, assigns to it a purely nervous mechanism, and calls it an "inverted tic." The muscular reactions were normal. The child recovered suddenly within three years. The condition may possibly be related to the most recent conceptions of narcolepsy.<sup>2</sup> In both cases the inhibition was almost continuous, but in Klienberger's case it occurred as an intention phenomenon, and did not appear when he was passive. The patient suffered attacks of migraine.

We may now turn to two of the latest articles on familial periodic paralysis, in reference to aberrant and simulating affections. Bing<sup>3</sup> describes the type or classical form as follows: While the muscles are usually flaccid, individual muscles may show an increase of tonus. It is distinctly an "aura" affection, at least in diurnal attacks, and begins with paræsthesias, feeling of fatigue, somnolence, and thirst. The attacks may be retarded by active exertion (Couser). When the approach of one is perceived, forced walking or writing will postpone attacks in the legs and arms respectively. It is known that rest exerts the opposite effect. Non-motor elements may be present, although rarely—acute dilatation of the heart, arrhythmia, bradycardia, defective sensibility in the paralysed area, and profuse sweating. Under differential diagnosis Bing mentions Lenoble's transient spastic paralysis already described, which has also been looked upon as familial myotonia and paramyotonia. He also mentions periodic hysterical paralyses, which need not detain us.

<sup>1</sup> *Chronica medica Mexico*, 1911, xiv., 169.

<sup>2</sup> Klienberger, *Berlin. Klin. Wochens.*, 1913, No. 6.

<sup>3</sup> Mohr and Stähelin's *Handbuch d. inn. Med.*, 1912, v., 733.



Other conditions of much greater interest include intermittent malarial paralyses. Bing quotes only the cases of Hartwig and Cavare, which were paraplegias of quotidian or tertian type, sometimes with paralysis of the sphincters. As a rule the paralysis accompanies the outbreak of chill and fever, and yields with them to quinine. In intervals, however, indications of paralysis are often seen. This condition has been studied much nearer home, for in 1890 Browning of Brooklyn reported a long series of cases, chiefly in children.

Another peculiar affection has been described as attacking stable hands in Switzerland and also in Japan, the foci being quite independent. Gerlier, in Switzerland, calls it "paralysing vertigo," while its Japanese name is "Kubisagari." It readily disappears with change of occupation. In the midst of unimpaired general health there appears periodically a flaccid paralysis, attacking, perhaps, the entire musculature or else sparing the limbs. The neck and eye muscles seem to be always involved, and the clinical expression may be dysphagia, paralysis of masseters, diplopia, and amblyopia. Vertigo also coexists. Activity exerts a favourable influence, rest the reverse. This condition seems too little known to compare it with familial periodic paralysis, and Bing does not give the results of the full neurological examination.

Jendrassik<sup>1</sup> terms the classic type "Paroxysmal Familial Myoplegia," and enumerates the following briefly of transition forms with other heredo-degenerations. He only gives:—

1. Bernhardt's case (father and son) of familial dystrophy, plus paroxysmal paralysis.
2. Lenoble's transitory spastic paraplegia.
3. Isolated non-familial forms.

There is no possibility of confusing hysteria, Meniere's vertigo, or myasthenia, because in none of these is there loss of electric excitability.

It is evident that transitional or imitative forms of familial periodic paralysis should be linked together or differentiated from one another by the presence or absence of certain components, in addition to differences in clinical expression. For example, there

<sup>1</sup> Lewandowsky's *Handbuch d. Neurologie*.

are certain nervous affections which express themselves by periodic crises, yet show no tendency to become worse. According to Jendrassik family periodic paralysis belongs here, along with migraine, certain tics, and perhaps myasthenia. But some cases of the former (Holtzapple's) have ended fatally, and the affection in the horse quoted by Meyer-Betz has some mortality.

A condition, the most common expression of which is familial, must be heredo-degenerative, according to some. Batten's familial myoplegia associated with Friedreich's disease might be an instance of a transition form. The fact that the paralysis does not seem to have been intermittent might have been due to the cerebellar element. Bernhardt's case, showing the combination with familial progressive muscular dystrophy, is likewise of interest. Lenoble's transient spastic paraplegia is mentioned as a transition form. The favourable influence of motion and unfavourable effects of rest are also seen in Thomsen's disease, even more marked than in familial periodic paralysis.

Of much more significance, and not excluding the possibility of a heredo-degenerative state, are cases like those of Holtzapple. The migrainous equivalent present here appears to solve the nature of the condition for some authors. The "aura" factor, the occasional sensory phenomena, &c., suggest to Jendrassik a common psychoneurosis group brought about by a vasomotor ischemia. Elsewhere we have shown that a vasomotor factor does not harmonise with the clinical evidence. There is no doubt, however, that such a factor may cause a hemiparesis, with aphasia, an arm paresis, and ophthalmoplegia with migraine, &c. All these phenomena seem unilateral. Thus the vaso-constriction is not peripheral, but occurs only as a result of ischemia somewhere in one cortex. Jendrassik, however, attempts to solve the problem by making the ischemia occur in the anterior grey columns of the cord. Such a view is modelled on that of Flatau and Bornstein; the latter, however, speaks only of epilepsy in this connection, not migraine. He bases his view that epilepsy has paretic equivalents (although only mono- and hemiplegias) and upon the fact that he has seen the two conditions in the same subject. He has seen periodic paralysis succeeded by epilepsy and *vice versa*.

The vasomotor component stands in some relationship with the autotoxic component. The occurrence of acetonuria and a peculiar form of hæmoglobinuria, in the Meyer-Betz's syndrome, are some

of the data which point to a possible toxæmia.<sup>1</sup> However, these are somewhat rare. It is stated that not a few patients try to persuade themselves that their inferiority is the result of over-eating, and claim that fasting benefits them. This is not borne out by neurologists. Jendrassik takes the view of Holtzapple, who demonstrates the actual association with migraine, while the notion of an epileptic affiliation is largely speculative.

<sup>1</sup> Apropos of the therapeutic side of periodic paralysis, the report of Dr H. Willoughby Gardner in *Brain* (Part iii., Vol. 35, Feb. 1913) is worthy of mention. His patient was a big, hulking, country youth of 17, who came under observation in the first instance in 1907, with a history of having been subject for the previous two years to attacks of complete loss of power in the arms and legs. There was no sign whatever of any disease. Nevertheless, the attacks recurred, and Dr Gardner had the opportunity of observing the patient in one of these in June 1907, which was as follows: The patient awoke with a headache at 4 A.M., June 8, and found he was unable to move arms, legs, or head. When examined later in the day, he was noted to be unable to move his head, except very slightly from side to side, but the facial muscles were uninvolved. He was just able to move his arms; the legs were completely immobile, except for a feeble movement of the toes. There was no impairment of any form of sensibility. The deep reflexes in the arms and legs were completely abolished. The muscles of the limbs failed to react either to faradic or galvanic stimuli. The heart was slightly dilated, and there was a soft systolic murmur most evident in the aortic and pulmonary areas. The pulse rate was 42. As the patient was unable to pass urine, a catheter was used. He was drowsy, and complained of pains in the limbs. By eight o'clock the following morning the attack had already begun to pass off, and by noon he had regained motor power in the arms and legs. The reflexes and electrical reactions were brisk, and the next morning he walked five miles home, apparently in perfect health. The attacks recurred with increasing severity and frequency until the effects of treatment made themselves apparent, and at present the patient is in full work as a collier, and is the father of a healthy child of 2 years. Gardner's comments on the case are instructive and illuminating. It appears that in this instance the attacks of paralysis seem to have replaced previous attacks of "bilious headache." Latterly they became associated with very violent attacks of vomiting. Either the attacks themselves or the warnings, Gardner notes, nearly always began on a Sunday. They certainly have been associated on not a few occasions with the patient's playing football on the Saturday previous. They always developed during sleep, the patient waking up to find himself paralysed. The cause is unusual, however, in that no hereditary element could be traced, although periodic paralysis is one of the few truly hereditary diseases. Gardner believes that the essential condition underlying the disease is a "congenital defect of metabolism." It is easy to see that the author takes essentially the position of Holtzapple, and that his type of cases is similar to Holtzapple's sub-type. Most observers of periodic paralysis have carried out treatments similar or analogous to those which Gardner pursued, but they have not had as good results as Gardner reports. It is therefore obvious that there are radically different classes of cases grouped under the one designation of family periodic paralysis.

In setting up types of disease it is proper to follow only examples of *large familial incidence*, in which the members all or directly tend to show a common type. Thus far we have only the original (Goldflam) type, the Holtzapple, and the author's. The other types are seen only in very small incidence, which is not enough for the study of a familial disease (Batten's might be excepted, but is not periodic).

This has, of course, nothing to do with individual variation; the familial element could be left out of account (*i.e.*, occurrence in repeated generations), and all of these expressions of periodic paralysis analysed in respect to periodicity and otherwise.

*Introduction to Report of Author's Sub-Type.*—While it is possible for us to classify all types of transient familial palsies under the broad designation of periodic palsy, it does not seem desirable to do so when the palsy is too atypical in its manifestations and course, and especially when a few cases of the periodic type present a fairly well-established etio-pathology such as those studied by Goldflam. When attempts are made to apply Goldflam's interpretation to the whole group of periodic palsies, the whole hypothesis of the nature of the periodic palsies falls to the ground. These defects in observation, however, are not pertinent to the type upon which I shall make preliminary report to-day, inasmuch as the disorder is a sub-type of family periodic palsy, if one follows the fairly definite criteria of periodic palsy as stated by E. W. Taylor, namely, the disease or syndrome shows the following symptoms: "Periodicity, flaccid motor paralysis, loss of electrical excitability; loss of deep reflexes, and, between attacks, relatively perfect health." None of the cases to which I shall briefly refer show any of these marked symptoms.

My material is drawn from a known family stock of four generations, of nineteen members, in which nine members have shown the transient palsy described. The attacks, although having no essential clinical resemblance to it, are called "rheumatic" by the various members of the family afflicted, and as a class they call themselves the "stiff people," although here, too, no stiffness of muscles obtains. The grand attacks are characterised by a more or less complete and abrupt inability to move any of the voluntary muscles. The disorder occurs at irregular intervals of days, weeks, or months throughout the life of the several members of the family. It might rather be termed as an

inhibition disorder than a palsy *per se*, as there are no electrical changes, no alterations in the deep or superficial reflexes during the attacks, and the muscle tonus does not seem to be altered during any of the observed attacks. Sensibility is not demonstrably altered. There is at times in some cases involvement of the muscles innervated by cranial nerves, notably the ocular muscles, the tongue, pharynx, the lips, and the respiratory muscles (dyspnoea).

The earliest case known is that of the great-grandfather, and followed in all the five female children of his family, the four male members being exempt. The two female members of the third fraternity, consisting of three members, have the disorder, while the one male member is exempt. In the fourth generation, which is still in infancy, the oldest member being 5, the disorder appears as yet in but one female member of the six children. The fourth generation consists of two female and four male children. While the disorder apparently originated in the great-grandfather, the disease transmitted by him has occurred exclusively in the female members of the different fraternities since. In this respect the disease follows the usual rule. The male members, however, have not been without the suspicion of a certain hereditary taint, as two have suffered from diabetes, one dying in coma from the same. In the last two fraternities of the fourth generation acetonuria and acetone poisoning have occurred in four of the male children, one having died from acetone poisoning. Other family peculiarities will be given in the brief case history of each. It may be taken for granted, when various symptoms and signs are not mentioned, that such neurological inquiries have been of a negative character. The last two generations have been under my observation for the last eight years. The two female members of the third generation having married physicians and trained neurologists, one may be sure that no pains have been spared to unravel the real nature and significance of the affection. All our efforts in this direction so far have been unavailing. The possibility of obtaining suggestions as to further lines of research and investigation that may bear fruit in the future is one of the main reasons for placing the sub-type on record at this time.

The subject matter covering my new sub-type was submitted to Prof. Charles B. Davenport, of the Carnegie Station for

Experimental Evolution at Cold Spring Harbour, who made the following pertinent comment, that the disorder appeared to him like a sex character (female) except for its occurrence in Thos. J. "As the chart stands, it might very well be that of a *dominant* trait. If, however, Thos. J. married a close relative, and if M. J. in the second generation did the same, it would count equally for the result even if it were recessive." Prof. Davenport added a criticism which applies equally to many another study of familial disorder heredo-degenerative in character, that a great fault of the charts prepared by medical men is that they assume all traits are dominant, and, therefore, consider the ancestors along one line.

But little is known of the great-grandfather (Thos. J.), the apparent initiator of the disorder, except that he was a merchant sea captain of industrious and sober habits, born in England, and engaged in the coast trade of that country. He was married and had nine children, two being born before he had his first attack of the disease, which occurred at about the age of 28. The attack of total inability to move his arms and legs occurred within a few hours after a short period of rest, before which he had suffered prolonged exposure to a severe wetting storm. In a few hours the attack passed off, but apprehending he was soon to be afflicted with a permanently disabling palsy, he soon retired from active sea service. Attacks similar to the first one here noted continued to appear at irregular intervals throughout the remainder of his life. He died of an intercurrent affection of the kidneys when between 60 and 70 years of age. The second generation will be considered in the order of birth.

1. Thomas J., Jun., was a lawyer and politician. He never had anything the matter with him until he was about 28 years old, at which time he was out one night delivering a speech and went to bed apparently well, but the next morning he was found dead. No autopsy was performed. He was married, but had no issue.

2. Mary J., mother of the third generation, died at 28 years of age soon after the birth of her third child. During the pregnancy she had evidence of Bright's disease, and succumbed to symptoms of the latter disorder. It is reported that she had peculiar attacks of "stiffness" or so-called rheumatism all her life. Her two daughters, my patients and also my informants, state that minor and major attacks of inability to stir, lasting a few

hours every few days and weeks, were of fairly frequent occurrence in their mother's life. The attacks grew more frequent and severe as the mother grew older. The attacks occurred after a short rest, following severe and exhausting physical and mental efforts. There never was any pain or physical discomfort other than the embarrassment resulting from the sudden loss of power of locomotion. Control of sphincters was never lost. In point of fact, voiding urine in this patient, as in all the others, helped to break up the disablement. Her disability often appeared without her knowledge. She would be sitting at her work or in conversation, and when she wished to rise or change her position would be unable to move. All the relatives can detect the presence of an attack in one of their number without being so informed, yet nothing peculiar in the position or expression of the afflicted member is obvious to a bystander. In minor attacks, when some slow and feeble movements, in the legs especially, were still possible, assisting the patient to walk up and down the room might be the means of ridding the patient of the attack. At other times such efforts made the condition worse. Various dramatic yet highly embarrassing mishaps occurred in this patient as in the others, such as being attacked and suddenly collapsing on railroad tracks, hauled from in front of moving vehicles, and being carried miles away beyond their railroad destinations, which latter mishap frequently occurred both on account of physical inability and diffidence in explaining to strangers their peculiar plight. This patient, as others in the group, often had an attack while standing on the street kerb waiting for a car. In such instances physical support in the standing posture would not be wanting, and at such times even progression on the level could be slowly undertaken, but the street car step would be too high for them to reach, and once in the street several city blocks would be traversed before a sufficiently low kerb would permit the patient to step up on it, and thus return home or get to a place of safety or rest while a carriage could be called. At times the disability would be circumscribed to locomotion, and at others to a generalised but incomplete weakness or defective use of the more onerous or vigorous movements, especially in the thigh flexors. This patient was a bright, intelligent, robust, and handsome woman, as are all the women members of the family. The mental capacity of all members of the family is decidedly above the

average. No insanity, hysteria, or psychoneurotic episodes are known to have occurred in any of the families.

3. Sarah J. is still living, and is about 50 years of age. She has always had the disability attacks as detailed in the preceding case. The family thinks the attacks are less severe and frequent as she grows older. The attacks were particularly frequent between 25 and 30 years of age; at that period the patient suffered a great deal from indigestion. Indigestion is indifferently present and absent in the different members of the family afflicted, without there being any particular relationship of cause and effect in the occurrences. This patient, as well as all her living sisters, reside in California. The third generation lives in New York State.

4. Chrissie J. is about 48 years old, and although she is very frequently and seriously affected with the locomotor disability or palsy, she leads a very active life. She is described as a bright, strong, handsome woman. Even though she drives, rides horseback, and walks a good deal, her movements are not very sprightly. Her speech or cranial nerves are never affected, and the disability is largely confined to the lower extremities. As in all the cases, the degree of disability is always bilateral, both legs are synchronously involved and recover equally. The defect is always most marked from below upward, and recovery usually in the reverse order. The duration of the attacks is never determined by the apparent degree of motor disability in the several attacks. This patient has always claimed that frequent urination helps her to stave off attacks, diminish their severity, or postpone actual attacks. She has particularly noted this benefit to follow if she can frequently void urine when taking long drives. If one desires to consider this statement seriously, a number of physiological principles may be invoked; but an unbiassed close observer has failed to note the great benefit claimed by the afflicted people. However, the alleviating expedient here recounted should not be too readily cast aside.

Cases 5 and 6, Kate J. and Annie J., are not especially noteworthy, and are practically the same as the first two sisters in the nature of their attacks.

7. Herbert J. died of diabetic coma at 31, which began at 26 years of age. The disease was typical and classic in every respect. He never suffered from any motor disability.



8 and 9, the remaining members of the second generation, died in earliest infancy from diphtheria, and of course presented no disorder of locomotor defect.

In the third generation we have to consider three individuals, Mrs H. and Mrs F., both under my observation, and daughters of Mary J. and Alex. G., the only issue of Sarah J., the other sisters being unmarried or without issue. Mrs H. and Mrs F. are twins, and the manifestations of their disorder are quite identical in all essential respects.

Alex. G. has never suffered from the motor disability *per se*. While he is a bright intelligent lad of 18, weighing about 150 pounds, he is not strong. He has never been able to pass his physical examination at school. He has no physical endurance, and is easily tired. It is thought he has a "touch of diabetes." How accurate this statement may be it is impossible to determine, as he lives in California, and is rather averse to giving details of himself. In a recent report it is stated he is growing slower in his movements, and the muscle weakness is increasing. In his photograph he looks well developed, and is a strikingly handsome boy. His general physical weakness has often been ascribed to laziness.

Mrs H. and Mrs F., both now 28 years old, may be treated in the matter of descriptive notes as one case. Both showed their disorder at an early age, one at  $2\frac{1}{2}$  and the other before 4 years of age. The one at  $2\frac{1}{2}$  years, Mrs H., had her first attack after a long carriage drive with her father. She was allowed to remain in the carriage for an hour or so, as the father thought she could help herself out of the carriage if she only would. She was finally carried to the house, and the attack gradually wore off in the course of the evening; the exact time is not known. Her sister, Mrs F., had her first attack at three or four years of age after sitting for some time on a porch bench. Both gradually developed the locomotor disorder to a high degree until marriage at 19, at which time the attacks in both cases underwent some degree of betterment for a short time. Pregnancies in both cases, however, made the condition worse. They each have had three children. The oldest of Mrs H.'s children, a boy, died of acetone poisoning at 18 months of age; the second child, a girl, has violent attacks of the same affection, and is now  $2\frac{1}{2}$  years old. The youngest is 1 year

old, and while he has frequent attacks of indigestion, no acetone attacks have developed.

Mrs F.'s children, three in number, show the following: The first, a girl, is just beginning to show the affection. But last week, after an auto ride, she began to cry and lagged behind the others in entering the house, saying: "Mamma, my legs are stiff; I cannot walk. My legs won't go right." For some time she walked slowly, stiffly, and awkwardly, and kept repeating: "See, mamma, they don't go, and I cannot make them go." The disability passed off completely in a few minutes. At 10 months neither this child nor the second one, a boy  $2\frac{1}{2}$  years old, was able to turn over unassisted. The musculature in both children, while apparently normal, is lacking in power of endurance in any prolonged test. The boy has frightful acetone attacks, during which he complains of not being able to lift his legs, and continually asks to have them rubbed.

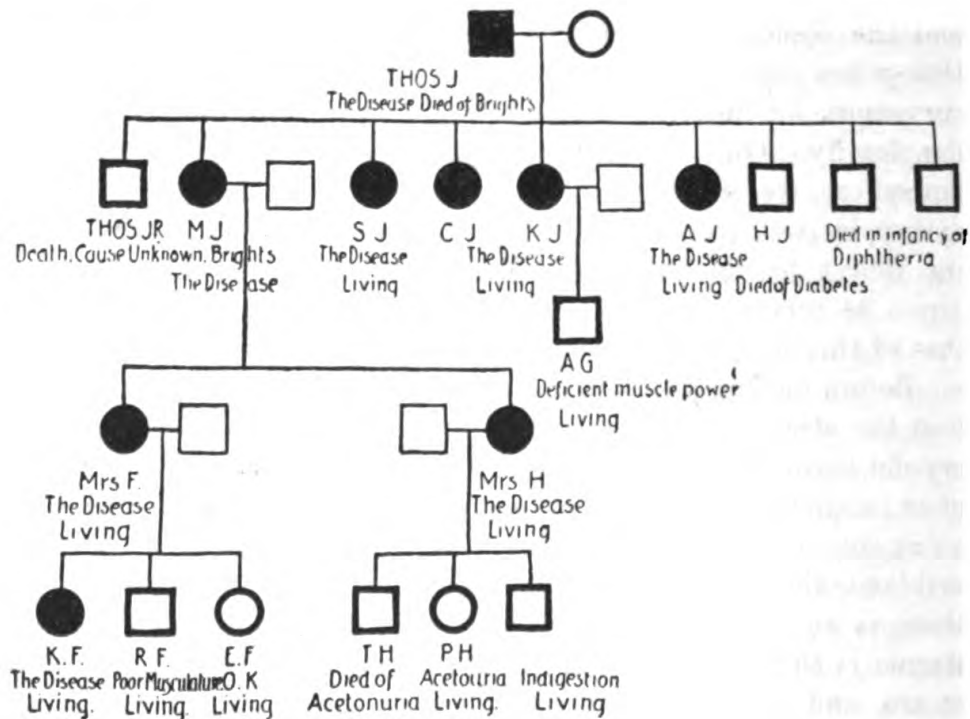
The obvious suggestion presented in this last statement has been absolutely fruitless in searching the urine of the self-styled "stiff people," those afflicted with motor disability. The blood, urine, and stool analyses so far reveal nothing in this affection.

To finish the case notes in the fourth generation: The knee jerks in Mrs F.'s children are barely detectable by reinforcement, and the oldest, the little girl, has a marked lordosis, so marked that when she was taken to an orthopædist recently for the curvature, he inquired if any cases of dystrophy were known in the family. On further examination, however, he became convinced, as we all have who have seen that no condition of dystrophy was present, but that the muscle tonus is poor, that the defect in general metabolism was responsible for the condition of relaxed vertebral spine. No defect in muscle tone like that of this child holds good for any of the adults afflicted.

Before closing these brief notes of case histories I would say that the attacks are shown in their severest degree and range of muscle involvement in the case of Mrs F., the case about which most is known. In many of her attacks, which last usually half a day, and scarcely more than a day at the outside, the neck is involved, the eyes are staring and are moved with difficulty; there is an inability to use the muscles about the mouth; the tongue is thick; swallowing difficult, and an oppressive dyspnoea occurs, and inability to breathe deeply (diaphragmatic weakness)

is often shown. Again, such severe attacks may come on so abruptly that she is not aware they are upon her until she attempts to move or rise. One day last week Mrs F. entered a train for a short journey, feeling quite well. She sat still for half an hour reading a magazine. On attempting to leave the train all movement was impossible, and she had to be carried to a carriage. She said, in writing me about these attacks: "I just felt helpless; had no movements at all. I could just speak. It wore off slowly, much more slowly than in my other attacks. *Independently of attacks*, I fatigue quickly now. I do not walk too much; over-exertion seems to snap something somewhere, and then I have no power and am weak. My sister and I both get very severe attacks of stomach indigestion, but they are always independent of the attacks. The indigestion somehow makes for attacks, and then some blood vessel or nerve spasm occurs somewhere inside and causes the attack." Of course, one may too easily rely on a patient's observations regarding the cause of his own case, but clinicians may learn not a little from such remarks.

I append a genealogical chart of the afflicted family for easy reference.



In brief, then, we have here a hereditary family inhibition, paralysis, or disability independent of a psychosis, without electrical changes and without reflex alteration. The disabilities are purely motor in character, involving voluntary and occasionally involuntary muscles. The type, while nearest in clinical manifestations to some of the recorded cases of periodic palsy, is sufficiently to be differentiated from the Goldflam and Holtzapple types to warrant us in leaving it unclassified and separate from any of these known types.

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### MYASTHENIA GRAVIS WITH EXOPHTHALMIC GOITRE.

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A MARRIED woman, 38 years of age, was admitted to the Royal Prince Alfred Hospital under my care, complaining of weakness and tiredness in arms and legs, difficulty in swallowing, impediment in speech, with prominence of the eyeballs and occasional diplopia of about twelve months' duration. Her family history was good. She had always lived in a healthy locality, and was practically a teetotaller. She had had four children, the youngest 5 years of age; no miscarriages, and nothing in her past history to suggest syphilis. She had previously been a strong, healthy, well-developed woman, but much domestic worry led to considerable loss in weight and to the onset of the present symptoms. So far as we were able to ascertain her first symptoms were prominence of the eyeballs, especially the right, with some chronic conjunctivitis. This appears to have been accompanied by some general nervous weakness and depression, but nothing very definite until about five months before admission. She then noticed that her right hand and arm had become weak, so that she was unable to scrub, or strike an octave on the piano. The left hand at this time was not affected. She was treated with massage and improved somewhat. Subsequently the weakness returned, was more marked than before, and now extended to the left arm and the legs.

On examination on admission her temperature was normal, her pulse 90, regular and of moderate tension, and respirations 25. She was somewhat thin and wasted, facial expression rather sad. She lay comfortably in bed. Skin was dry with the exception of the palms of the hands which were cold and moist and covered with a clammy perspiration. The thyroid gland was moderately enlarged, more on the right side than the left.

*Examination of Nervous System.*—Her intelligence was good. Her expression somewhat vacant and far away, and she was somewhat emotional. She was not aphasic. On first beginning to speak her articulation and voice were natural, but in a very short time the voice became nasal in character and her articulation so indistinct as to be almost unintelligible, reminding one of the character of the speech in a case of bulbar paralysis. After a short period of rest her speech would be almost normal again. She had no fits.

*Cranial Nerves.*—Sense of smell normal. Sight normal; no colour-blindness. There is some exophthalmos, more marked in the right eye than in the left, with widening of the palpebral fissure. There is more or less complete external ophthalmoplegia, which varied, however, from day to day. No nystagmus. Pupils equal and round, moderately dilated, react to light and convergence; cilio-spinal reflex present. There is chronic conjunctivitis, and the eyelids cannot be completely closed. There is no actual paralysis of the muscles of the jaw, tongue, palate, or pharynx, but these muscles rapidly become exhausted so that mastication and deglutition become almost impossible, with tendency to regurgitation of fluids through the nose. After a period of rest, however, these muscles recover their power.

There is weakness in the muscles of the neck, so that she cannot hold her head upright for any length of time. There is weakness in both arms, more especially the right. Grip fairly good in both hands; flexor power fair at elbows and wrists, and stronger than the extensor at the same joints. The muscles were poorly nourished, but no hypotonia. Co-ordination good. The muscles of the arms became so rapidly exhausted that she was unable to continue to feed herself. The muscles of the legs showed similar condition of weakness and rapid exhaustion. Her gait was unsteady, but no definite ataxy and no Rombergism. On testing the muscles with electricity they responded at first briskly

to both faradic and galvanic current, but rapidly became exhausted and ceased to respond altogether.

There was no paræsthesia, and no interference with the conduction of normal sensations.

*Reflexes.*—Conjunctival on the right side modified, on left side normal. Palatal present. Epigastric and abdominal absent on both sides. Plantar reflex showed extensor response on both sides. Jaw jerk absent; wrist jerk absent on both sides; elbow jerk ditto; knee jerks active on both sides, which, however, rapidly became exhausted; no ankle jerk or clonus was obtained. The sphincters were normal.

The heart sounds were normal; the pulse rate was constantly quickened, varying from 90 to 130. It was regular; blood pressure 98 mm. of mercury. Examination of the blood showed erythrocytes, 4,850,000; leucocytes, 6,000; hæmoglobin, 93 per cent.; colour index, .96; no marked change in morphology of blood cells. The urine showed nothing abnormal.

Her condition remained practically the same, except for gradual increase in muscular weakness and exhaustion. About a month after admission she had a bad attack of dyspnœa which lasted half an hour, and was relieved by the hypodermic injection of ether and oxygen inhalation. Similar slight attacks recurred. Finally, a very severe attack occurred, in which the intercostal muscles and diaphragm both became inactive, and she died very shortly.

The extract of pituitary gland was administered every other day for a fortnight, but did not appear to produce any amelioration of symptoms. Adrenalin chloride was equally ineffective. Strychnine alone seemed to do any good.

The double extensor response of the plantar reflex in this case is a feature which, so far as I can ascertain, has not been hitherto observed in this disease. Farquhar Buzzard, in his article on *Myasthenia Gravis* in Allbutt and Rolleston's "System of Medicine," says: "The superficial reflexes are generally preserved, and the plantar response is of the flexor type." In view of this statement, which may be taken to represent the combined experience of those who have written upon this disease, the presence of a double extensor response and exaggerated knee jerks in this patient might suggest the coexistence of some degeneration in the pyramidal tracts; but the fact that the jerks were of the typical

myasthenic type, being easily exhausted, together with the absence of ankle clonus, any involvement of the sphincters, and the absence of any history or sign of syphilitic infection, would negative this view. The double extensor response means, of course, some interference, temporary or permanent, with the functions of the pyramidal tracts in brain or spinal cord, but there was nothing observed in this patient to indicate the nature of that interference. Possibly further observations on cases of this disease may throw some light on this interesting point.

## Abstracts.

### ANATOMY.

**MÖLLGAARD'S RETICULUM.** THOMAS J. HELDT, *Journ. Comp. (423) Neurol.*, 1913, xxiii., August, p. 315.

"WITH a simplified smear method, both the Nissl's bodies and the neurofibrillæ are found present in the spinal nerve cells of the dog, fixed *twenty-five* seconds after decapitation. There is no evidence that they are artefacts due to post-mortem changes as described by Möllgaard.

"Nissl's bodies and neurofibrillæ may also be demonstrated, in a more or less modified condition, in frozen neural tissue. The freezing causes the Nissl's bodies and nuclear chromatin to assume the form of a reticulum. This reticulum is identical with Möllgaard's reticulum, or 'glia-network.'

"Möllgaard's reticulum is produced during the process of freezing, and is due to the displacement incurred by the enlarging and expanding ice-masses which form in the cell or tissue at the reduced temperature."

A. NINIAN BRUCE.

### PHYSIOLOGY.

**ON THE CEREBRO-CEREBELLAR TRACTS.** (Ueber die zerebro-(424) zerebellaren Bahnen.) C. BESTA, *Arch. f. Psychiat.*, 1913, l., H. 2.

THE author gives the results of careful experimental studies on the cerebro-cerebellar tracts, using partly secondary degeneration studied by Marchi's method, and partly Gudden's method of studying cell atrophy in growing animals after lesions of distant areas, supplemented by studies of recent changes in cell groups

after similar lesions. The following are the author's conclusions: (1) The pedunculus cerebri consists exclusively of fibres coming from the cortex, and contains two parts. The first comes from the lobus fronto-sigmoideus, passes in the lateral part of the pedunculus, and enters into relation with the cells of the peri-peduncular and intra-peduncular lateral groups and of the ventro-lateral area. The second part comes from the lobus temporo-parietalis. These fibres occupy the median part of the pedunculus, and are connected with the cells of the median peri-peduncular and intra-peduncular groups, and with the cells of the para-median and ventro-median area. (2) There are no fibres of cerebropetal course in the pedunculi cerebri, and the author denies the existence of a cerebral component in the ventral part of the pons, which is maintained by von Monakow and others. It is true that after destruction of the pedunculi cerebri in new-born animals most of the cell groups of the ventral aspect of the pons disappear; but he considers this not as a Gudden degeneration, but as an atrophy of secondary order due to want of functional stimuli. (3) The brachium pontis is formed by cerebellofugal and cerebellopetal fibres. (4) The cerebellopetal fibres of the brachium pontis go for the most part to the opposite side of the cerebellum, but a small portion is homolateral. (5) The cerebellofugal fibres spring from the cerebellar hemisphere, and end in the ventral portion of the pons and the tegmentum of the opposite side. The termination of those fibres which go to the tegmentum is not established, but they do not, even in part, go to the thalamus. (6) The brachium conjunctivum consist exclusively of cerebellofugal fibres. (7) The fibres of the brachium conjunctivum cross completely. (8) The author does not consider it definitely established that the fibres of the brachium conjunctivum come exclusively from the cells of the nucleus dentatus. It is possible that a certain proportion of them come from the cerebellar cortex. They enter into connection with the cells of the red nucleus, and with those of the thalamus of the opposite side; a small number go to the nucleus of the oculo-motor nerve. The author does not consider that his investigations are of wider application than to the animals on which he experimented, *i.e.*, the dog and the cat.

C. MACFIE CAMPBELL.

**THE CONTROL OF THE SUPRARENAL GLANDS BY THE**  
**(426) SPLANCHNIC NERVES.** T. R. ELLIOT, *Journ. of Physiol.*, 1912,  
xliv., July 15, p. 374.

THE author measured the amount of adrenalin that can be extracted from the suprarenal glands of the cat by means of delicate blood-pressure experiments, and found that the suprarenal glands



contain almost equal amounts of adrenalin on each side. He also found that the fright induced by morphia or  $\beta$ -tetrahydro-naphthylamine exhausts the residual adrenalin, that all ordinary conditions of anæsthesia, with ether, chloroform or urethane, as well as excitation of afferent nerves (*e.g.*, the sciatic), or direct injury to the brain, are attended by exhaustion or loss of adrenalin. The centre controlling such loss is close to the bulbar vaso-motor centres. The efferent path is by the splanchnic sympathetic nerves. Their section prevents this exhaustion, none of the above causes, nor diphtheria toxin, having any direct exhausting action on the suprarenals. Faradisation of the splanchnic nerves discharges adrenalin into the blood, causing a characteristic drop in the rising curve of blood pressure, and such phenomena as paradoxical pupillo-dilation. It appears probable that the suprarenal glands are played upon by the splanchnic nerves in the emotional and vaso-motor reflexes with almost as delicate and ever-changing an adjustment as are the muscles of the peripheral tissues connected with the sympathetic nerves.

A. NINIAN BRUCE.

**THE RELATION OF THE HYPOPHYSIS TO GROWTH, AND THE  
(426) EFFECT OF FEEDING ANTERIOR AND POSTERIOR LOBE**

DEAN D. LEWIS and JOSEPH L. MILLER, *Archives Int. Med.*, 1913, xii., August, p. 137.

HYPERSECRETION of the anterior lobe of the hypophysis causes abnormal development of certain portions of the body, especially the bony structures. In the Fröhlich syndrome of adiposity and failure of sexual development, it is thought by many that there is lessened function of the posterior lobe; experimental evidence, however, suggests lessened secretion of the anterior lobe. Studies in metabolism in acromegaly are again inconclusive.

Partial removal of the anterior lobe in young animals modifies growth and sexual development in such a manner as to resemble closely Fröhlich's syndrome. Removal of the posterior lobe has no effect. Feeding experiments have proved negative. (*Cf. Review*, 1912, x., pp. 373 and 567.)

A. NINIAN BRUCE.

**PATHOLOGY.**

**ON EPENDYMAL GLIOMATOSIS OF THE BRAIN VENTRICLES.**

(427) (Ueber ependymäre Gliomatose der Hirnventrikel.) M. S. MARGULIS, *Arch. f. Psychiat.*, 1913, l., H. 3.

THE author reports the result of the examination of seven cases in which there was a marked gliomatous proliferation of the ependyma of the ventricles. The anatomical picture consisted

in a hyperplasia of the ventricular ependyma and in the development in the walls of the ventricles and in the neighbourhood of the nucleus caudatus of peculiar foci of gliomatous proliferation. In the cortex, too, a certain amount of neuroglia proliferation was demonstrated. There were no inflammatory changes of the vessel walls. The author considers the ependymal gliomatosis as a focal manifestation of a general proliferative gliomatous process. No clinical picture corresponded to the anatomical findings. The cases were of variable diagnosis, and syphilis was denied in all; epileptiform convulsions or apoplectiform attacks were mentioned in several of the cases. The author comes to no conclusion with regard to the etiology of the histo-pathological changes.

C. MACFIE CAMPBELL.

**ON THE ABSENCE OF THE CORPUS CALLOSUM IN THE HUMAN**  
(428) **BRAIN.** (*Ueber Balkenmangel im menschlichen Gehirn.*) W. STOECKER, *Arch. f. Psychiat.*, 1913, l., H. 2.

THE report of a case of an 18-year-old general paralytic at whose autopsy the corpus callosum was found to be absent. In place of the commissural system of the corpus callosum there was an extensive system of longitudinal fibres reaching from the frontal region to the occipital lobe; this formed the dorso-mesial limit of the lateral ventricle, and in the occipital lobe the tapetum of the ventricle. The pillars of the fornix did not unite to form one body, but remained separate throughout. The septum lucidum was absent. The gyrus fornicatus consisted of a broad mass of convolution, which extended on both sides to the great longitudinal fissure. The anterior commissure was normal. In addition, on the median aspect, and on the convexity of the brain, the pattern of convolutions and fissures showed certain deviations from the normal.

C. MACFIE CAMPBELL.

**HISTOLOGICAL FINDINGS IN A CASE OF JUVENILE GENERAL**  
(429) **PARALYSIS.** (*Reperti istologici in un caso di paralisi generale giovanile.*) A. REZZA and A. VEDRANI, *Riv. ital. di Neurop. Psychiat. ed Elettroter.*, 1913, vi., p. 254.

GIRL, aged 13, heredo-syphilitic.

*Cerebrum.*—Moderate degree of infiltration and hyperplasia of the pia; considerable infiltration of the cerebral vessels of all sizes, consisting chiefly of plasmocytes, most marked in certain regions (cornu Ammonis); absence of vascular proliferation, circumvolutions atrophied with reduction of the grey substance; various changes in the nerve cells; changes in the neuroglia chiefly of a progressive character.

*Cerebellum*.—Meningeal and vascular changes as above. Atrophy more marked, especially in certain regions, with reduction of all the elements and almost entire disappearance of Purkinje's cells. Purkinje's cells with two nuclei not frequent (2-3 in a section), characteristic changes in their dendrites, but typical fusiform expansions of Sträussber very rare. Perusini's *eisengierig* substances very abundant in the atrophic cells.

J. D. ROLLESTON.

**MICROSCOPICAL INVESTIGATION OF THE NERVOUS SYSTEM  
(430) IN THREE CASES OF SPONTANEOUS MYXŒDEMA. R.**

BRUN and F. W. MOTT, *Proc. Roy. Soc. Med.*, 1913, vi., June (Sect. of Psychiat.), p. 75.

"THE changes in the nervous system in myxœdema consist in a general chromatolysis of the nerve cells of a subacute character, and secondary to the disease.

"These changes, though general, are not of the same intensity throughout the different ganglionic structures, but they seem to affect in a particularly grave manner the autonomous bulbar-motor system (nuclei of the ninth and tenth nerves), and in second line the cerebro-spinal motor neurons and the sympathetic system.

"Clinically, the affection of the vago-glosso-pharyngeal system can lead to severe vagal attacks, or, in advanced cases, to a fatal acute bulbar paralysis."

A. NINIAN BRUCE.

**CLASSIFICATION OF TUMOURS OF THE PITUITARY BODY.**

(431) GERHARDT v. BONIN, *Brit. Med. Journ.*, 1913, May 3, p. 934.

THE author proposes the following classification:—

I. Heterotopic tumours.

1. Tumours of the cranio-pharyngeal duct.
2. Teratomata.

II. Homiotopic tumours.

1. Epithelial tumours:

- |                          |  |  |
|--------------------------|--|--|
| (a) From anterior lobe   | $\left\{ \begin{array}{l} \text{Chromophibe} \\ \text{Chromophobe} \\ \text{Combined} \end{array} \right.$ | $\left\{ \begin{array}{l} \text{Cubic cell adenoma.} \\ \text{Round cell adenoma.} \\ \text{Carcinoma.} \end{array} \right.$ |
| (b) From pars intermedia |  |  |

2. Tumours developed from connective tissue:

- |  |   |
|--|---|
| (a) From anterior lobe and pars intermedia | $\left\{ \begin{array}{l} \text{Fibroma.} \\ \text{Sarcoma.} \end{array} \right.$ |
| (b) From posterior lobe.                   | Glioma.   |

3. Mixed tumours. Fibro-adenoma.

This is followed by a brief explanation of the above classification.

A. NINIAN BRUCE.

## CLINICAL NEUROLOGY

**THE OCCURRENCE OF ANKLE-CLONUS WITHOUT GROSS  
(432) DISEASES OF THE CENTRAL NERVOUS SYSTEM. W.**

TILESTON, *Amer. Journ. Med. Sci.*, 1913, cxlvi., p. 1.

TILESTON reviews the literature, and records four personal cases.

1. Girl, aged 14 years. Septicæmia following sinus thrombosis, marked ankle- and jaw-clonus. Post mortem, no meningitis nor gross lesions of central nervous system, moderate degenerative changes in pons, and small foci of myelitis not involving pyramidal tracts.

2. Girl, aged 8 years. Severe typhoid fever. Profuse intestinal hæmorrhage on twenty-fifth day, followed by marked ankle-clonus lasting for five days.

3. Girl, aged 15, in last stage of phthisis, ankle-clonus five days before death.

4. Girl, aged 17, in third stage of phthisis, ankle-clonus six weeks before death.

Tileston's conclusions are as follows :—

1. True ankle-clonus may be found in (a) acute infectious diseases, especially typhoid. (b) Chronic infections, especially pulmonary tuberculosis in the third stage. (c) Uræmia shortly before and during the seizure. (d) Epilepsy immediately after the convulsion. (e) Intoxication from certain drugs, *e.g.*, hyoscine, ether, and chloroform. (f) Excessive fatigue. (g) Exceptional cases of certain neuroses, viz., neurasthenia, hysteria, and paralysis agitans. (h) Psychoses in the stage of excitement. (i) Chronic articular rheumatism.

2. With the exception of joint disease, in which a constant spinal irritation from the inflamed joints is the probable cause, a toxic action on the nervous system is probably the underlying factor in the production of clonus.

3. In two autopsies on cases of phthisis with clonus, no changes were found in the central nervous system. In the writer's case, however, inflammatory exudate was found about the posterior median artery in the posterior septum of the bulb.

4. Clonus due to a toxic state can usually be distinguished from that due to organic disease by the absence of spasticity, and of the Babinski and Oppenheim signs, except after the medicinal use of hyoscine, and immediately after an epileptic attack, when the Babinski and Oppenheim signs are present.

5. The occurrence of ankle-clonus is of prognostic value in uræmia, preceding at times the acute seizure (*v. Review*, 1909, vii., p. 783). Ankle-clonus usually disappears a few days before death, otherwise its disappearance indicates improvement in the patient's condition.

J. D. ROLLESTON.

**ACUTE ATAXIA WITH RAPID RECOVERY.** (*Sur un cas d'ataxie* (433) *aiguë avec guérison rapide.*) RISPAL and PUJOL (Toulouse), *Gaz. d. Hôp.*, 1913, lxxxvi., p. 901.

A WOMAN, aged 23, with a neuropathic heredity and personal temperament, after an acute infection of uncertain nature, developed marked ataxia of all four limbs, scanning and explosive speech, and intention tremors. The intelligence and sphincters remained intact. There was no disturbance of subjective sensibility, but pressure of the muscles was painful. Adiadocokinesis was present. The knee jerks were exaggerated, and the abdominal and anal reflexes lost. Sense organs normal. After lasting for about ten days the symptoms rapidly improved.

J. D. ROLLESTON.

**THE REBOUNDED PUPIL.** FRANK R. FRY, *Journ. Nerv. and Ment.* (434) *Dis.*, 1913, xl, July, p. 437.

A PUPIL which contracts to light, and promptly dilates or rebounds to a position which is steadily maintained without alteration in the light stimulus, has, along with other abnormal pupillary reactions, a confirmatory value, and should always be noted.

D. K. HENDERSON.

**ON THE VARIOUS CLINICAL EVOLUTIONS OF TOXI-INFECTIVE MYELITIS.** (*Sur les évolutions cliniques diverses des myélites toxi-infectieuses.*) BERNHEIM, *Rev. de méd.*, 1912, xxxii., p. 1.

BERNHEIM shows that the field of toxi-infective myelitis is much larger than is supposed. The condition may be latent during life, and only be revealed post mortem by histological examination of the cord. Sometimes it is manifested only by slight symptoms, such as exaggeration of the reflexes, the presence of Babinski's sign, numbness, and weakness. In other cases the myelitis is well marked, but abortive, and clears off rapidly. On the other hand it may be prolonged, and take on the form of diffuse myelitis, combined sclerosis, or disseminated sclerosis; but in spite of these alarming symptoms which may persist for months or years, recovery takes place either completely or with certain residues. The course of the myelitis may be marked by acute

attacks, separated from one another by intervals ranging from weeks to years, and end in partial recovery or finally prove fatal. Cerebral, cerebellar, or neuritic symptoms may be associated with those of myelitis. This great variability in the evolution of the various forms of myelitis is characteristic of toxi-infection.

Illustrative cases are given of typhoid fever, pneumonia, influenza, miliary tuberculosis, and neurasthenia.

J. D. ROLLESTON.

**ZOSTER OF THE INFERIOR MAXILLARY NERVE.** (*Zona de la (436) 3<sup>e</sup> branche du trijumeau (nerf maxillaire inférieur).*) H. K. SERMAKSÉCHIAN, *Thèses de Paris*, 1912-13, No. 409.

THE thesis contains references to twenty-six cases, including an original one. The writer's conclusions are as follows:—

1. Zoster of the inferior maxillary nerve is relatively rare, and may be observed at any age. (a) The inferior maxillary nerve may be affected as a whole, or only in part. (b) Zoster of the inferior maxillary nerve may form part of the herpes zoster of the fifth nerve, when the latter is affected as a whole. (c) Zoster of the inferior maxillary nerves may coexist with zoster affecting the neighbouring nerves.

2. The principal causes appear to be trauma, intoxications, and especially general infections, specific or otherwise.

3. The nerve changes may be situated in the brain, the cranial ganglia and roots, or in the peripheral nerves.

4. The neuralgic pains, and especially the localisation of the eruption with or without constitutional symptoms, are the principal elements in diagnosis.

5. The most frequent complications are facial paralysis and ear troubles (inflammation of the external auditory meatus, leading to perforation of the drum and deafness), which may be transitory or persistent.

J. D. ROLLESTON.

**BLOOD-VESSEL CHANGES CONSEQUENT ON NERVOUS LESIONS.** (437) T. WINGATE TODD, *Journ. Nerv. and Ment. Dis.*, 1913, xl., July, p. 439.

IN this article clinical and experimental evidence is brought forward to prove that obliterative changes, occurring in blood vessels by means of hypertrophy and hyperplasia of the several coats, more especially the media and intima, are occasioned by a loss of trophic control evidenced by a lesion of the vascular nerves. Such changes in the blood vessels are the exciting cause of trophic lesions of the skin and deeper tissues, and are seen in some cases of so-called cervical rib (*v.* p. 431).

D. K. HENDERSON.

**DISCUSSION ON CERVICAL RIBS—**(438) **The Anatomy of Cervical Ribs.** F. W. JONES.**Surgical Treatment.** W. THORBURN.**Some Points in the Surgery of Cervical Ribs.** P. SARGENT.**The Results of Operative Treatment.** C. M. HINDS HOWELL.**Some Points in the Symptomatology of Cervical Ribs, with especial Reference to Muscular Wasting.** S. A. KINNIE WILSON.*Proc. Roy. Soc. Med.*, 1913, vi., March (Clin. Sect.), pp. 95-141.

IN the first paper it is pointed out that there seems to be an antagonism between the formation of a nerve plexus for the supply of the limb and the development of ribs in that region from which the nerves are derived. This antagonism is manifested in the bony elements by the pressure marks stamped by the nerves upon the developing bone. The brachial plexus is subject to many variations, but in a typical plexus a portion of the first thoracic nerve ascends within the thorax to pass out over the first rib with the brachial plexus, causing the *sulcus subclaviæ*. If this nerve be large, the tension between the lowest cord and the first rib increases, and may cause such symptoms as are usually ascribed to the presence of a cervical rib. Should the second thoracic nerve be added to the plexus, the antagonism between nerve and rib element may lead to a curtailment of the first rib, which then presents characters surprisingly like those seen in a case of developed cervical rib. Just as varying grades of imperfection of development of the first thoracic rib are the outcomes of varying degrees of post-fixation of the plexus, so the varying grades of perfection in the development of a cervical rib are the outcomes of varying degrees of prefixation of the plexus. When the development of the costal process is in excess of the plexus alteration, strain is produced and the symptoms, motor, sensory, and vascular, are developed, the result of pressure upon the lowest cord of the plexus. As growth proceeds the shoulders drop back, especially in women, and the greater the drop of the arm relative to the highest rib, the greater the tension between the lowest cord of the plexus and that rib, a symptom which will be relieved by a deliberate elevation of the shoulder-girdle. A patient with cervical ribs thus tends to select a position which will raise the shoulder of the affected arm as far as possible, *e.g.*, the shoulders may be hunched up almost to the ears, and it is also to be noted that the patient lies on the painful side, while in most other painful conditions of the arm they lie on the sound side.

Mr Thorburn gave results of operation in 20 cases. *Pain* was present in all; it was completely cured in 12, relieved in 3, and 5 were lost sight of. *Paralysis* was noted in 12; it was cured in 5, greatly relieved in 5, and 2 were not traced. *Atrophy* of the

hand muscles was improved. Tactile *anæsthesia* could always be cured. Sense of *coldness* was apt to remain. In two cases he produced a transient paralysis of the brachial plexus of only a few days' duration. In 1 case the suprascapular nerve was injured, but recovered in three months, and in 2 cases the pleura was opened, causing symptoms for ten and fourteen days respectively.

Mr Sargent summarised 34 operations in 29 patients, 26 of whom were females. The average age was 38.7 years. The first symptom noticed was pain in 17, numbness in 5, clumsiness in the fingers in 3, and swelling or coldness of the hand in 4. The average length of time between the onset of symptoms and the operation was over three years. The symptoms for which the patient sought relief were: pain alone, 4; pain and wasting, 9; pain and numbness, 6; wasting and numbness, 5; and wasting alone, 5. In every case the abnormal ribs were bilateral, though rarely symmetrical. The immediate result of operation had been bad in 2 cases, one developing paralysis of the upper limb and the other a hysterical monoplegia. A few showed a transient numbness, the greater number being cured.

Dr Hinds Howell tabulates the results of 30 operations, and concludes as follows: "In a large proportion of cases some symptoms, such as pain and weakness in the arm, may be expected to follow the operation, but not to last more than three months or so. The vasomotor symptoms, which are present in almost all the cases, will be certainly improved, and in the majority of cases pain will be relieved or cured. With regard to muscular weakness and atrophy, the expectation is that the operation, if it is not too long delayed, will greatly improve this condition. There is not, as a rule, complete restoration of the wasted muscles, nor complete recovery from the vasomotor disturbance."

Dr S. A. Kinnier Wilson discussed the symptomatology of cervical rib, especially with regard to the motor and sensory symptoms. Sensory symptoms may be classified as subjective and objective. They consist of tingling, numbness, pins and needles, usually unilateral, and referred mostly to the ulnar or radial side of the hand rather than to all the fingers. Pain is usually felt only in the forearm, hand, or fingers, and mostly radiates downwards. Loss or diminution of sensibility never exactly harmonises with a root supply. There are two main types of muscular involvement. The first or "median type" is very frequent. The abductor pollicis and opponens pollicis alone are involved, all the other thenar muscles, including the flexor brevis pollicis, being intact. All these three muscles are supplied by the median nerve, and thus this condition strongly suggests that the first two muscles get their root supply from the seventh cervical and the flexor brevis from the eighth cervical. The wasting is



often so profound in these two muscles that it is difficult to account for it merely as an example of the special proclivity for abductor muscles to be paralysed before adductor, as pointed out by Ferrier. This condition is to be contrasted with the *global* atrophy in progressive muscular atrophy. The other type of muscular atrophy corresponds roughly to the ulnar distribution, *i.e.*, general wasting of the interossei and an approximation to the *main en griffe*.

A. NINIAN BRUCE.

**PARALYSIS OF THE SERRATUS MAGNUS.** E. C. HUGHES, *Proc. Roy. Soc. Med.*, 1913, vi., March (Clin. Sect.), p. 165.

A FEW notes on the case of a policeman who was assaulted by five men and thrown against a gate, striking his right shoulder.

A. NINIAN BRUCE.

**DISCUSSION ON THE ÆTIOLGY OF UNILATERAL PARALYSIS**  
(440) **OF THE RECURRENT LARYNGEAL NERVE.** Opened by  
F. DE HAVILLAND HALL, SIR DAVID FERRIER, and W. PERMEWAN,  
*Proc. Roy. Soc. Med.*, 1913, vi., June (Laryngol. Sect.), p. 139.

DR HALL gives the following table, compiled from all the cases of unilateral laryngeal paralysis which he could find in the *Proceedings of the Laryngological Society* from 1893 to 1907, 52 in number, together with a further series of 64 cases of unilateral recurrent paralysis which he had observed himself:—

	Right.	Left.
Aneurysm of arch of aorta - -	3	28
" " (subclavian) - -	1	0
Mitral stenosis and enlarged left auricle -	0	4
Enlarged bronchial and other glands -	1	6
Disease of apex of lung - -	1	0
Malignant disease of lung - -	0	8
New growths in thorax - -	0	5
Malignant disease of œsophagus - -	9	8
Thyroid tumours - -	3	2
Influenza (vocal cord not stated, 1) -	2	0
Diphtheria, lead (one each) - -	0	2
Neuritis - -	4	2
Tubes, syringomyelia, disseminated sclerosis, bulbar paralysis, general paralysis of insane - -	3	6
In combination with other paralyses, as hemiplegia, facial, palate, pharynx, trapezius, and sterno-mastoid -	6	4
Doubtful cause - -	0	7
(Side not stated, 1)	33	82
Total	116	

Sir David Ferrier pointed out that the incomplete form of recurrent laryngeal paralysis is by far the most frequent, and that the greater vulnerability of the abductor fibres is only an example of a more general law applicable to extensors in general, and that he is inclined to adopt the view that the recurrent laryngeal paralysis usually observable in tabes is of peripheral origin.

Dr Permewan gives Avellis' figures published in 1891 from an analysis of 150 cases, and an analysis of 360 cases reviewed during the past ten years, using StClair Thomson's classification, as well as 63 cases published by Guder and Dufour in 1910. Six cases have been recorded by Casselberry of unilateral paralysis from cerebral disease, in spite of the fact that the cerebral localisation of the laryngeal muscles is bilateral.

Sir Felix Semon gravely doubted whether the laryngeal phenomenon could be claimed as a simple example of Ferrier's more general law, although he fully admitted it seemed to fall into line with it, since (1) while the antagonistic muscles of the limbs served physiologically equivalent functions, those of the larynx served *two different* functions (phonation and respiration), which were differently represented in the cortex and in the medulla; (2) after division of the adductor fibres of both recurrences, *no inhibition* of the abductors follows stimulation of the cortex as in genuine antagonistic muscles; and (3) *organic* progressive disease always attacks the *abductors* first, or even alone, whilst in *functional* affections the *adductors* suffered similarly exclusively. He also thought the question of the origin of tabetic laryngeal paresis was still quite open.

A. NINIAN BRUCE.

**ON DEGENERATIONS OF THE SPINAL CORD IN PERNICIOUS**  
(441) **ANÆMIA.** (Ueber Rückenmarksdegenerationen bei perniziöser Anämie.) R. O. LENEL, *Arch. f. Psychiat.*, 1913; l. H. 2.

REPORT of a case which came to autopsy, with review of the literature.  
C. MACFIE CAMPBELL.

**SYPHILITIC INFECTION FOLLOWED BY LANDBY'S SYNDROME,**  
(442) **AND LATER BY TABES DORSALIS.** E. D. MACNAMARA,  
*Lancet*, 1913, August 9, p. 385.

THE patient contracted syphilis in 1898, and apparently had been thoroughly treated. In 1904 he developed a flaccid paralysis of the legs, ascending a few days later to the arms and some of the muscles supplied by certain cranial nerves. There were no sensory

symptoms. The symptoms passed away in the same order as they arose, and six months later he had practically recovered.

In 1907 he developed a paralysis of his sixth cranial nerve with diplopia. This disappeared after treatment with pot. iod. and mercury.

In 1911 he began to suffer from neuralgic pains. His gait was ataxic, Romberg's sign was present, the patellar and Achilles jerks were absent, all forms of sensation in the legs were abolished, and the pupils were immobile. In 1913 the Wassermann reaction was found to be positive, and the cerebro-spinal fluid showed a slight lymphocytosis. This sequence of events appears to be unique.

A. NINIAN BRUCE.

**SPINAL GLIOSIS AND SYRINGOMYELIA. MARKED INVOLVE-**  
(443) **MENT OF THE CERVICAL CORD WITH DESTRUCTION OF**  
**THE POSTERIOR ROOTS, BUT PRESERVED PUPILLARY**  
**REACTION. GLIA TUFT ON THE FLOOR OF THE FOURTH**  
**VENTRICLE.** (Gliosis spinalis und Syringomyelie. Starke Beteiligung des Halsmarkes mit Zerstörung der Hinterstränge bei erhaltener Pupillenreaktion. Gliastift am Boden des vierten Ventrikels.) E. SIEMERLING, *Arch. f. Psychiat.*, 1913, l, H. 2.

THE clinical report of a case, with complete anatomical examination.

C. MACFIE CAMPBELL.

**HEREDITARY DEGENERATION AND POST-DIPHTHERITIC**  
(444) **PARALYSIS.** (Heredodegeneration und postdiphtherische Lähmung.) H. BENEDICT, *Deut. Zeitschr. f. Nervenheilk.*, 1913, xlv., p. 492.

THE patient was a boy, aged 16, who presented an enormous congenital nævus involving the right side of the thorax and right upper limb. The area affected corresponded to the lower sixth cervical and upper sixth dorsal skin segments. The mother had a rudimentary right pinna and congenital right facial palsy, another child who had died shortly after birth had had right club foot and malformation of the spinal cord, and the maternal grandmother had slight facial asymmetry and convergent right internal strabismus.

After an ordinary attack of diphtheria the boy, in addition to palatal and ocular palsies, developed motor and sensory monoplegia of the right upper limb, which became swollen and cyanotic. In the lower extremities the knee and ankle jerks were lost, but there was no paralysis.

This is the first case on record of a congenital defect of the nervous system determining the localisation of diphtheritic paralysis.

J. D. ROLLESTON.

**ENCEPHALO-MYELITIS AFTER SMALLPOX, WITH REMARKS (445) ON DISEASES OF GLANDS OF INTERNAL SECRETION.**

(Encephalo-myelitis nach Pocken (zugleich ein Beitrag zu den Erkrankungen der Drüsen mit inneren Sekretion).) O. KLIENBERGER, *Arch. f. Psychiat.*, 1913, l, S. 632.

THE patient was a woman, aged 31, who had had a mild attack of smallpox in childhood. Four weeks after the onset she had had sudden paralysis of the right arm and left leg, accompanied by aphasia. Within seventeen days the aphasia passed off, and there was gradual improvement in the paralysis, but recovery was not complete. Seven or eight years later tremors developed in the right, and subsequently the left arm, leg, and trunk became similarly affected. Gradual improvement took place. Some years later the hands began to increase in size and thickness, and the patient suffered from headache, giddiness, and tinnitus. She also had a tendency to diarrhoea and sweating, and there was some exophthalmus.

The paralysis and aphasia are attributed to encephalo-myelitis, and the tremor and disturbance of growth to secondary hydrocephalus, which, as Goldstein has shown, may produce symptoms of pituitary disturbance (*v. Review*, 1911, ix., p. 203). The symptoms of thyroid involvement were secondary to the pituitary lesions.

J. D. ROLLESTON.

**ACUTE CEREBRO-SPINAL MENINGITIS WITH CEREBELLAR**

**(446) SYNDROME.** (Méningite cérébro-spinale aiguë avec syndrome cérébelleux.) COYON and JOLTRAIN, *Paris méd.*, 1912-13, ii., p. 212.

A MAN, aged 65, was admitted to hospital with cerebro-spinal meningitis which had developed a week after an injury to the occiput. Lumbar puncture showed the presence of meningococci. Some improvement followed injections of anti-meningococcic serum, but signs of cerebellar involvement set in, shown by vertigo, titubation, slow and explosive utterance, nystagmus, and cerebellar catalepsy. Post mortem a purulent exudation was found covering the pons, inferior surface of the medulla, and the cerebellum. Histological examination of the cerebellum showed considerable thickening of the meninges, which were infiltrated with mononuclears, arteritis, and peri-arteritis, and areas of softening in the nerve substance. A cerebellar form of cerebro-spinal meningitis has not hitherto been recorded.

J. D. ROLLESTON.

**RECOVERY FROM TUBERCULAR MENINGITIS, WITH REPORT (447) OF CASES.** R. L. PITFIELD, *Amer. Journ. Med. Sci.*, 1913, cxlvi., p. 37.

A RECORD of a personal case in a man, aged 50, the subject of pulmonary tuberculosis. Lumbar puncture gave issue to fluid under pressure containing 3 acid-fast bacilli. No cyto-diagnosis was made owing to admixture of the fluid with blood, and no animal experiments were carried out. Rapid improvement followed lumbar puncture, and within two years the patient was able to resume his work of linen-draper.

Including the present case, Pitfield has collected 29 examples of undoubted tubercular meningitis in which recovery took place, and 8 others were doubtful. In 10 the autopsy confirmed the early diagnosis. In 18 tubercle bacilli were found, and in 5 of these guinea-pig inoculation was positive. In 4 tubercles of the choroid were seen. In 7 tuberculosis was found elsewhere.

J. D. ROLLESTON.

**TYPHOID MENINGITIS.** (Les méningitis éberthiennes.) J. MILHIT, (448) *La médecine moderne*, 1913, xxii., p. 12.

A FATAL case of purulent meningitis in a girl of 8 years arising in convalescence from typhoid fever. A pure culture of typhoid bacilli was obtained from the turbid cerebro-spinal fluid during life.

Although more than 60 cases of typhoid meningitis are on record, Milhit can find only 15 other cases in literature besides his own in which a pure culture of typhoid bacilli was obtained during life from the cerebro-spinal fluid. [To these may be added the cases recorded by Lavenson, Henry and Rosenberger (*Review*, 1908, vi., p. 597), Schwartz (*ib.*, 1911, ix., p. 31), David and Speik (*ib.*, 326), and O'Carroll and Purser (*ib.*, 1912, x., p. 446). —J. D. R.] The term typhoid meningitis should only be applied to meningeal symptoms due to the typhoid bacillus or its toxins, and therefore the cases published before the discovery of the typhoid bacillus must be rejected. When the typhoid bacillus was first discovered lumbar puncture was unknown, and the diagnosis of meningitis was only made post mortem. Such cases are open to criticism, owing to the readiness with which organisms are diffused throughout the body after death.

Three varieties of typhoid meningitis may be distinguished—1. Suppurative; 2. Serous; 3. Abortive.

The condition must be distinguished by lumbar puncture from myelitis, to the occurrence of which in typhoid fever Milhit had previously drawn attention (*v. Review*, 1909, vii., p. 661).

J. D. ROLLESTON.

**TRANSITORY CEREBELLO-SPASTIC SYNDROME IN CON-**  
**(449) VALESCENCE FROM TYPHOID FEVER.** (Syndrome céré-  
bello-spasmodique transitoire dans la convalescence d'une fièvre  
typhoïde.) E. BARIÉ and J. COLOMBE, *Bull. et mém. Soc. méd. Hôp.*  
*de Paris*, 1913, xxxv., p. 1259.

A WOMAN, aged 35, of nervous disposition, twenty-three days after her temperature had become normal, presented symptoms of cerebellar inco-ordination, characterised by intension tremor, nystagmus, titubation, asynergy, and adiadocokinesis, without modification of speech, and accompanied by the following spastic symptoms: exaggeration of knee jerks, ankle-clonus, and peculiar gait. The spastic phenomena persisted some time, while the cerebellar symptoms disappeared in a few weeks.

This syndrome is rare, but occasionally occurs in convalescence from acute infections, such as typhoid fever, pneumonia, diphtheria (*v. Review*, 1909, vii., p. 664), measles, or malaria. It belongs to the group of cases entitled acute ataxia, of which Leydon (1868) and Westphal (1872) reported the first examples. Acute ataxia bears a certain resemblance to multiple sclerosis, but improvement and recovery occur within a few weeks or months. Possibly acute ataxia may be the first stage of multiple sclerosis, but hitherto no progressive case has been published. J. D. ROLLESTON.

**MYELITIS FOLLOWING TYPHOID FEVER IN A CHILD.** (Myélite  
**(450) métatypique chez un enfant de quatre ans.)** J. RENAULT and  
P. P. LÉVY, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxvi.,  
p. 80.

A BOY, aged 4½, who had had typhoid fever a month previously, was admitted to hospital with paraplegia. The various segments of the lower limbs showed extreme contracture, the knee and ankle jerks were exaggerated, Babinski's sign was present, and there was incontinence of urine and faeces. No marked sensory disturbance. Cerebro-spinal fluid normal. Wassermann negative. Under careful nursing complete recovery took place within three months, though typhoid bacilli were still present in the urine three months after the onset of the infection. The possibility of subsequent spinal cord sclerosis is mentioned (*cf. Review*, 1909, vii., p. 661).

J. D. ROLLESTON.

**BULBAR PARALYSIS IN TYPHOID FEVER.** R. FITZ, F. G.  
**(451) BRIGHAM, and J. J. MINOT,** *Boston Med. and Surg. Journ.*, 1913,  
i., p. 957.

A PREVIOUSLY healthy man, aged 40, was suddenly seized with fever, difficulty in swallowing, and weakness of the legs. He died

eight days from the onset with symptoms of bulbar palsy. The course of the paralysis was diffuse, not typically ascending or descending.

Post mortem typical lesions of early typhoid fever were found in the small intestine, and typhoid bacilli were found in cultures from the spleen. Sections of the brain and cord showed nothing remarkable.

The literature shows that acute bulbar paralysis may occur as a rare complication of typhoid fever. There are 12 such cases on record occurring in adults. In 8 the symptoms developed at the height of the disease, and in 4 after convalescence had begun. In 2 the disease started suddenly with a chill and various nervous manifestations. Eight died.

Of 5 cases submitted to thorough histological and bacteriological study, 2 showed nothing abnormal in the brain or cord, 1 showed atrophic changes in various peripheral nerves, 1 had microscopical hæmorrhages at different levels of the medulla and brain, 2 showed positive bacteriological findings. From the brain and cord of one, typhoid bacilli were recovered; from the other an unidentified coccus.

The condition may therefore exist without evident tissue change in the nervous system, or be due to peripheral nerve lesions or to a hæmorrhagic encephalitis, or finally to the presence of organisms in the brain, whether typhoid bacilli or secondary invaders.

J. D. ROLLESTON.

**NEUROMA CUTIS (DOLOROSUM).** M. L. HEIDINGSFELD, *Journ. (452) Amer. Med. Assoc.*, 1913, lxi., August 9, p. 405.

A NEUROMA cutis implies some form of new growth in the skin, multiple or single, situated intimately in the skin, and containing new nerve elements. They are the seat of very severe paroxysmal pain of both spontaneous and secondary character, and are to be distinguished from amputation neuromas, neurofibromatosis, and other growths arising from subcutaneous nerves.

Only two well-defined cases have been reported so far, one by Duhring in 1873, involving the left arm and shoulder in a man aged 70, and one by Kosinski in 1874, involving the right thigh and buttock in a man aged 30.

The case here reported occurred in a man aged 50, and consisted of a small purplish-red nodule about the size of a split pea on the inner side of the right thigh four inches above the knee. It developed twenty-five years ago following a slight injury. It soon became the seat of severe paroxysmal pain, later almost inducing syncope.

On microscopic examination the tumour was considered to be a neuro-endothelioma of amyelinic type. Such cases are to be carefully distinguished from myoma cutis, of which fourteen cases have thus far been recorded.

A. NINIAN BRUCE.

**CEREBRAL COMPLICATIONS IN PNEUMONIA.** C. F. WITHINGTON, (453) *Boston Med. and Surg. Journ.*, 1913, i., p. 945.

WITHINGTON examined the records of 7,600 pneumonia cases at the Boston City Hospital, and found the following cerebral complications: 21 cases of meningitis (of which 5 were confirmed by autopsy and 2 by lumbar puncture), 4 of embolism, 2 of thrombosis, 1 of softening, 3 of abscess, 2 of œdema, 2 of hemiplegia, and 1 of transient aphasia. The diagnosis of encephalitis had not been made.

He also records a case of right hemiplegia with aphasia which ended in complete recovery within two months, being probably of toxic origin, with little or no destruction of brain tissue. A review of the literature is given.

J. D. ROLLESTON.

**THE EARLY SYMPTOMS OF ARTERIO-SCLEROTIC BRAIN DIS-**  
(454) **ORDER.** (Die Frühsymptome der arteriosklerotischen Gehirnerkrankung.) RAECKE, *Arch. f. Psychiat.*, 1913, l., H. 2.

THE author calls attention to the early insomnia, headache, dizziness, paresthesias, tremor, subjective sounds in the ears, transitory focal symptoms, occasional heaviness of the limbs, and alterations in writing. The subjective complaint of memory defect is an early symptom at a period when the defect cannot be objectively determined. A definite diagnosis of early cerebral arterio-sclerosis cannot be made on the ground of the mental changes alone. The neurological picture is the only trustworthy criterion.

C. MACFIE CAMPBELL.

**TWO CASES OF CIRCULATORY DISTURBANCE OF THE**  
(455) **BRAIN.** C. EUGENE RIGGS and E. M. HAMMES, *Jour. Amer. Med. Assoc.*, 1913, lxi., July 26, p. 257.

THE first case was one of thrombosis of the posterior inferior cerebellar artery (*v. Review*, 1913, xi., p. 441) in a man aged 47. His symptoms were severe occipital headache for four years, more marked in the recumbent posture; sudden attack of vertigo and diplopia, followed five days later by an attack of staggering,



hoarseness, difficulty in swallowing, and impaired pain and temperature sense over the right face and left extremities. Wassermann reaction in blood negative, blood pressure 138 mm., and urine loaded with sugar. Six months later a mild similar attack occurred. With rest in bed and potassium iodide he made a practical recovery except for sensory involvement of right face, a feeling of tightness in the throat, and persistent glycosuria.

The second case was a ruptured cerebral aneurism in a woman, aged 44, who, without any previous symptoms, suddenly fell downstairs, but with help was able to walk upstairs again. A restless, delirious state developed, and she died six hours later during the process of a lumbar puncture, where apparently pure blood was drawn off. A small ruptured aneurism about the size of a hazel nut was found near the bifurcation of the left posterior cerebral and posterior communicating arteries.

An abstract of the discussion on these two cases follows.

A. NINIAN BRUCE.

**A CASE OF "IDIOPATHIC" CEREBRAL ABSCESS.** JOHN (456) HENDERSON, *Lancet*, 1913, May 31, p. 1525.

THE patient was a healthy school boy, aged 13, who wakened one morning complaining of severe headache. A convulsion lasting thirty minutes followed this, seven others occurring during the day. Next day he had another convulsion, and cerebro-spinal meningitis was suspected, but next day he was perfectly well, and lumbar puncture gave a negative result.

For the next six months he suffered off and on from headaches, always frontal, and becoming steadily worse. Then fits of vomiting, without definite food relation, occurred three or four times a day, and he began to suffer from sleeplessness and constant headache. The temperature was normal, but Kernig's sign was present with some rigidity of the neck muscles, retracted abdomen, and a well-marked tache cérébrale, but he could understand all that was said to him, and could recognise and speak to friends. He died somewhat suddenly.

At the autopsy a large thin-walled cyst was found in the left lower parietal region. This proved to be an abscess which had extended inwards, and ruptured into the ventricle. The middle ears and all the internal organs were healthy.

As there was no evidence of the origin of infection, the case is considered as "idiopathic," although it is suggested that it may have been related to cerebro-spinal meningitis. Unfortunately the identity of the organism does not appear to have been established.

A. NINIAN BRUCE.

**RECKLINGHAUSEN'S DISEASE AND THE SUPRARENALS.**

(457) (*Maladie de Recklinghausen et capsules surrénales.*) I. BOSQUET, *Echo méd. du Nord*, 1913, xvii., p. 329.

A RECORD of seven cases from literature in which symptoms of suprarenal insufficiency occurred in Recklinghausen's disease, including the following personal case. Man, aged 46. General neurofibromatosis, bronze colour of skin resembling Addison's disease, low grade of intelligence, sexual frigidity, marked anorexia, profound asthenia, and pains in limbs.

J. D. ROLLESTON.

**MULTIPLE CONGENITAL OSTEOCHONDROMATA, WITH DE-**

(458) **GENERATION OF CRANIAL NERVES.** T. R. BOGGS, *Johns Hopkins Med. Bull.*, 1913, xxiv., p. 210.

A REPORT of a case in a man, aged 23, whose father had had "lumps in the legs." Double optic atrophy was present, and the acoustic nerves were completely degenerated, but the vestibular nerves were intact. The thyroid was atrophied. The issue of the case is not recorded.

J. D. ROLLESTON.

**INTRACRANIAL DIVISION OF THE AUDITORY NERVE FOR**

(459) **PERSISTENT TINNITUS.** CHARLES H. FRAZIER, *Journ. Amer. Med. Assoc.*, 1913, lxi., August 2, p. 327.

UP to the present time surgical therapy has been applicable to the treatment of functional disturbances in only three of the cranial nerves—the trigeminal, facial, and auditory—and of these the last is the latest to be brought within the scope of such treatment.

The above operation is indicated in cases of vertigo and tinnitus combined, and especially in persistent and intractable tinnitus which is so severe as to be the cause of serious mental disturbance. The most promising cases are those with loss of air conduction and preservation of bone conduction, with definite cochlear lesions in which the tinnitus is low-pitched. The resulting deafness is not a serious objection as the patient is usually already deaf on the affected side.

A case is recorded in a man aged 34 who developed persistent tinnitus, impairment of sensation in the distribution of the fifth nerve, and complete loss of vision on the same side following a fracture of the base of the skull, the result of his being struck on the head by a falling limb of a tree. As his general health was becoming impaired by the tinnitus, his eighth nerve was divided intracranially, and he was completely cured. The steps of the operation are briefly described.

A. NINIAN BRUCE.

**FUNCTIONAL APHASIA.** HECTOR MACKENZIE, *Proc. Roy. Soc. Med.*, (460) 1913, vi., June (Clin. Sect.), p. 220.

THE patient was a woman, aged 35, who developed complete motor aphasia a few days after her husband was seized with a right-sided hemiplegia and motor aphasia. She was able to speak normally a few days later, when a second attack, also complete, developed. This soon passed off. On eight or nine previous occasions she had similarly been aphasic, but never for more than a few hours at a time, and always occurring after some special worry. The Wassermann reaction was not investigated, but she had had three miscarriages.

A. NINIAN BRUCE.

**OCCUPATIONAL BRASS POISONING : BRASS-FOUNDER'S AGUE.**

(461) EMERY R. HAYHURST, *Amer. Journ. Med. Sc.*, 1913, cxlv., May.

BRASS poisoning may be narrowed down to those exposed to the inhalation of fumes arising from molten brass within the brass foundry. It may be defined as an acute malaria-like syndrome of chill, fever (sometimes), and sweat, appearing a few hours after the inhalation, for a few minutes or longer, of the vapours or fumes arising from molten brass, or from the fumes of pure zinc alone, affecting only or mostly those unaccustomed to such exposure. The symptoms set in with a dry, parched throat, an irritating and unproductive cough, a metallic taste, a feeling of constriction in the chest, lassitude, more or less anorexia, followed occasionally by nausea and sometimes emesis.

The chills rapidly increase into a distinct rigor which no amount of external heat appears to lessen. The patient feels deathly sick. These symptoms end almost by crisis, and are followed at once by a most profuse perspiration.

The results of an investigation of the hygienic and working conditions in eighty-nine brass foundries and three zinc smelters in Chicago are reported.

D. K. HENDERSON.

**ABSENCE OF THE ABDOMINAL REFLEX IN CHRONIC**

(462) **ALCOHOLISM.** (Fehlen der Bauchdeckenreflexe bei chronischen Alkoholismus.) H. SAUER, *Deut. Zeitschr. f. Nervenheilk.*, 1913, xlv., p. 229.

SAUER examined 132 patients in St George's Hospital, Hamburg—a town in which schnaps drinking is prevalent—and found in 65 absence of one or more of the six abdominal reflexes (right and left, upper, middle, and lower); 58 admitted more or less indulgence in alcohol. In 46 chronic alcoholism could be regarded as the cause of the absence of the reflexes, and in 19 other diseases were responsible. In the alcoholic cases there was a constant absence

of some or all the abdominal reflexes. Usually their condition varied, sometimes one and sometimes another being absent. After a long stay in hospital it was frequent to find that all the reflexes had returned. In some cases, chiefly patients with threatening delirium tremens, the reflexes were exaggerated. In 26 of the 48 cases there were other signs of chronic alcoholism, *e.g.*, neuralgia, tremor of hands and tongue, and hardness of the calf muscles, but in all the rest there were no symptoms pointing to alcoholism beyond the absence of the reflexes. Sauer, therefore, regards the absence of the abdominal reflexes as an important diagnostic sign of chronic alcoholism. J. D. ROLLESTON.

**A CONTRIBUTION TO THE STUDY OF PELLAGRA IN ENGLAND.**

(463) GURTH S. BLANDY, *Lancet*, 1913, clxxv., Sept. 6, p. 713.

NINE cases of pellagra are here described, all but one occurring in females. With the exception of one (aged 74), all were in early middle life, none had lived abroad, none were destitute, and several had been in the Napsbury Asylum for years. The types of insanity were: Confusional insanity (3), melancholia (2), primary dementia (1), chronic mania (1), idiocy (1), and manio-depressive insanity (1). The eruption was usually worst in July. The paper concludes with short notes on two further cases.

A. NINIAN BRUCE.

**NOTES OF A CASE OF PELLAGRA.** J. W. E. COLE, *Lancet*, 1913, (464) clxxv., Sept. 6, p. 717.

THIS case was that of a woman, aged 25, who developed a typical rash on the face and hands a few days after her admission to hospital. The mental state was one resembling katatonic stupor. At the age of 19 she had an attack of mania, but at that time exhibited no signs of pellagra. A. NINIAN BRUCE.

**OBSERVATIONS ON THE INTESTINAL BACTERIA IN PELLA-**

(465) GRA. W. J. MACNEAL, *Amer. Journ. Med. Sci.*, 1913, cxlv., June.

CERTAIN bacterial strains were subjected to agglutination tests, using the blood serum from cases of pellagra, and from normal individuals. Of 109 different sera from pellagrins, 74·3 per cent. gave complete agglutination, 10·1 per cent. almost complete, 2·7 per cent. marked, 2·8 per cent. slight, and 10·1 per cent. negative reactions. The 27 New York controls gave 6 complete agglutinations, 3 almost complete, 10 marked, 1 slight, 7 negative reactions. These results are held to be sufficiently important to stimulate further work along this line. D. K. HENDERSON.

**CASE OF MONGOLISM.** F. G. CROOKSHANK, *Proc. Roy. Soc. Med.*, (466) 1913, vi., June (Sect. Dis. Child.), p. 133.

**CASE OF MONGOLIAN IDIOCY.** EDMUND CANTLEY, *Proc. Roy. Soc. Med.*, 1913, vi., June (Sect. Dis. Child.), p. 133.

EACH author showed one case, the second being characterised by attacks of rapid breathing, the exact origin of which was uncertain. The first case was shown to illustrate the point that quite a number of European children, not idiots or imbeciles, exhibited Mongoloid characteristics. There is a discussion as to how far it is justifiable to use the term "Mongoloid."

A. NINIAN BRUCE.

**CARDINAL RICHELIEU'S DISEASE.** (*La maladie du cardinal* (468) Richelieu.) H. CLEU, *Rev. de M  l.*, 1912, xxxii., p. 194.

IN this interesting essay, which has been inspired by the paper of Poncet and L  riche on Calvin (*v. Revue*, 1908, vi., p. 437), the writer shows that Richelieu was throughout life the subject of tuberculous infection.

The condition was latent during childhood, but in adolescence he suffered from prolonged febrile attacks, accompanied by headache and melancholy, and later in life from h  morrhoids, rectal fistula, and chronic rheumatism, followed by an abscess of the arm. Death took place from pleuro-pneumonia.

J. D. ROLLESTON.

## PSYCHIATRY.

**ON THE FREQUENCY OF THE WASSERMANN REACTION IN**  
(469) **THE CEREBRO-SPINAL FLUID IN GENERAL PARALYSIS.**  
(*Zur Frage der H  ufigkeit der Wassermann-Reaktion im Liquor cerebrospinalis bei Paralyse.*) P. KIRCHBERG, *Arch. f. Psychiat.*, 1913, l., H. 3.

THE author reports the results of the examination of the blood serum and cerebro-spinal fluid in 100 cases of general paralysis, which he examined in the Ehrlich Institute for Experimental Therapeutics. In 93 cases the blood serum, in 78 the cerebro-spinal fluid, was positive. Of the 22 cases with negative findings in the cerebro-spinal fluid, 50 per cent. were cases of tabo-paresis. Of the 24 cases of tabo-paresis, 46 per cent. gave a negative Wassermann in the cerebro-spinal fluid. Four cases of general paralysis on the basis of congenital lues gave positive Wassermann both in the blood and in the cerebro-spinal fluid with a definite pleocytosis.

C. MACFIE CAMPBELL.

**GENERAL PARALYSIS WITHOUT REACTION OF THE**  
(470) **CEREBRO-SPINAL FLUID.** (Paralysie générale sans réaction du liquide céphalo-rachidien.) V. DEMOLE, *Rev. méd. de la Suisse rom.*, 1913, xxxiii., p. 555.

A WELL-MARKED case of general paralysis of six years' duration in a man, aged 44, in whom three successive lumbar punctures, with a month's interval between each, yielded a normal cell count. Wassermann's reaction was positive in the blood, but negative in the cerebro-spinal fluid. Errors of technique could be excluded.

J. D. ROLLESTON.

**THE SOURCE OF URINARY INDOL-ACETIC ACID IN TWO**  
(471) **DEMENTIA PRÆCOX PATIENTS.** ELLISON L. ROSS, *Archives Int. Med.*, 1913, xii., August, p. 231.

THE author found indol-acetic acid in 21 per cent. of 91 urines of healthy normal persons. Of 174 urines from dementia præcox patients, 48 per cent. contained indol-acetic acid.

The author found in two cases of dementia præcox in women that the indol-acetic acid output did not vary directly with anything, and appears to be more or less constant for each individual.

A. NINIAN BRUCE.

**A PSYCHOSIS FOLLOWING CARBON-MONOXIDE POISONING**  
(472) **WITH COMPLETE RECOVERY.** MARY O'MALLEY, *Amer. Journ. Med. Sci.*, 1913, cxlv., June.

A WOMAN, 45 years, was admitted to the Government Hospital for Insane, Washington, on 10th December 1910.

On 2nd November 1910 she was found in a deep coma, having been exposed to an escape of illuminating gas. She was removed to a general hospital, was unconscious for four days, and then improved so rapidly that on 13th November 1910 she was discharged as recovered.

A few weeks later, however, it was noticed that she became dull and forgetful, would have outbursts of laughter without provocation, lost herself on the streets, and generally behaved in a very confused way.

On admission to the Government Hospital on 10th December 1910 she was in a semi-stuporous state, and her replies to questions were usually incorrect and irrational. She was unable to feed herself, and in addition was unable to carry out the simplest orders.

Physically the deep reflexes were all exaggerated, a wrist

clonus, and the sign of Babinski were present on both sides. During her hospital residence she laughed without reason, she mistook the identity of those around her, and at times confabulated.

Later, however, she began to show a marked improvement, reacted normally to her environment, and acquired a good realisation of her condition.

D. K. HENDERSON.

**CONTRIBUTIONS TO THE CLINICAL STUDY OF HYSTERICAL**  
(473) **SITUATION-PSYCHOSES.** (*Beiträge zur Klinik hysterischer Situationspsychosen.*) F. STERN, *Archiv. f. Psychiat.*, 1913, L, H. 3.

THE author discusses on the basis of the clinical material of about 40 cases, 31 of which he gives in brief abstract, a group of psychoses to which he has given the name of hysterical situation-psychoses. The important factor is that these psychoses appear to be the definite reaction to a painful situation, the reaction having much in common with the hysterical mechanism. The painful situation or difficulty to which the patients reacted consisted of imprisonment either under suspicion or before or after the sentence. A good deal of attention has already been given to prison psychoses, many of which belong to the dementia præcox group of psychoses, while others arise on a less definite basis of degeneracy. The psychoses described by Stern arose also on a degenerative basis, the heredity of the patients being poor. The psychoses were not merely to be considered the reaction to a very emotional situation, because in some cases habitual offenders showed no evidence of any strong effect. The most important dynamic factor in the development of the psychoses was apparently the wish to be sick, this wish having, of course, not to be taken as a clear and purposeful one, but nevertheless as sufficiently strong to precipitate the flight into the psychosis. An analysis of the degenerative basis on which these psychoses arose did not disclose specific hysterical features, which only occurred in comparatively few cases. The constitutional basis was very varied. Notwithstanding the psychic anomalies of these individuals, it was a striking fact that in only two had there been any psychosis apart from a prison situation, and in the two exceptions there were special etiological factors. From the symptomatic point of view the psychoses consisted of attacks of excitement or stupor, showing considerable variety. The diagnosis from catatonic conditions was not always easy, but the complete absence of prodromal symptoms is an important differential point. In the stupor of the situation-psychoses, the patient on the whole has a more comfortable adaptation than is usually the case in the catatonic.

The Ganser symptom may be present in both, but is not quite identical in the two cases. The transfer of the patient out of the military or police environment into a civil hospital was of marked benefit in the case of the hysterical psychosis. The prognosis in these cases is, on the whole, very good so far as the attack is concerned, and in none of the author's cases did deterioration ensue. The author sums up his conclusions as follows: (1) The hysterical situation-psychoses frequently occur in persons on arrest under suspicion. They must be thought of even though the clinical picture appears to be that of catatonia or an epileptic psychosis, and even if there have been epileptiform convulsions. (2) These psychoses develop usually on the ground of a marked psychopathic constitution. Hysterical antecedents can be completely absent. (3) The wish to be sick is an important factor, as well as the marked emotion associated with the situation. (4) Symptomologically the most common conditions are the conditions of stupor or confusion running an acute course; there are all transitions from slight narrowing to deep clouding of the sensorium. Where the course is more protracted there is usually a great variety in the clinical picture. (5) In the milder forms an anxious effect is usually dominant. In the delirious forms reminiscences may be the dominant feature. (6) There is some amnesia with all except the mildest forms of the psychoses. (7) In the differential diagnosis from catatonia one must emphasise the acute attack, the favourable reaction to external surroundings, the theatrical or affected colouring of the picture, the absence of disorders of the general well-being, the maintenance of a somewhat comfortable position even in the stupor. (8) Pure simulation is improbable even where we meet some rather suspicious symptoms. A combination of genuine psychotic and simulated disorders is frequent. The prognosis is extremely good.

C. MACFIE CAMPBELL.

**THE PSYCHIC ACTION OF MESCALIN, WITH SPECIAL REFERENCE TO THE MECHANISM OF VISUAL HALLUCINATIONS.**

(474) A. KNAUER and W. J. MALONEY, *Journ. Nerv. and Ment. Dis.*, 1913, xl., July, p. 425.

THE authors start from the view-point that to clarify the symptomatology of psychiatry, psychiatrists should live through some of the different psychoses, and they accordingly proceeded to produce in themselves transitory psychoses by means of the delusional Mexican drug—mescaline.

Altogether twenty-three experiments were made by injecting the sulphate of mescaline subcutaneously. An intoxication was usually markedly developed in an hour, and consciousness, during



this intoxication, remained practically unclouded but tremendously limited.

The most remarkable feature of the intoxication was hallucinations, especially visual. Auditory hallucinations were occasionally present; sometimes those in the muscular sense sphere were quite astonishing.

The authors' experiences have seemed to indicate to them that five levels may be distinguished in passing from purely objective imagery to purely objective realisation. They state that all their hallucinations, no matter how weak, or how strong their imaginative force, no matter how feeble their development, remained indubitable hallucinations, and never sank to be merely ideas, the outcome of a vivid imagination.

They found no indication of the fundamental importance of sexual experience in the content of their artificial hallucinations and delusions, even when special means were taken to elicit it.

D. K. HENDERSON.

## TREATMENT.

### CASES OF EXOPHTHALMIC GOITRE TREATED BY X-RAYS.

(475) W. M. KINGSBURY, *Proc. Roy. Soc. Med.*, 1913, vi., June (Electrotherap. Sect.), p. 158.

### TREATMENT OF EXOPHTHALMIC GOITRE BY X-RAYS. W.

(476) IRONSIDE BRUCE, *Proc. Roy. Soc. Med.*, 1913, vi., June (Electrotherap. Sect.), p. 159.

THE first author showed 5 cases which had been treated by X-rays, all much improved. Two were men and 3 women. Tachycardia was a prominent symptom in all 5 cases, and completely passed away in all except 1 case, where it was greatly reduced.

The second author gave an analysis of 18 cases. Six did not appear for re-examination. Of the remaining 12, 4 were considered cured, 5—one of which had been operated upon—were "greatly improved," and 3 were "improved." All the patients expressed themselves as much better, and stated that their weight had increased. All the cases were treated with the X-ray tube at a distance of 18 to 12 in. from the skin, the surrounding part being screened off by a 4-in. thickness of felt. They had attended two or three times a week for periods varying up to two years.

A. NINIAN BRUCE.

## Reviews.

**IONIC MEDICATION.** (*The principles of the method and an account (477) of the clinical results obtained.*) H. LEWIS JONES. Crown 8vo, pp. viii. and 151. H. K. Lewis, London, 1913. Pr. 5s. net.

Now that "ionic medication" has taken a definite place in the treatment of disease, we wish to know next in what conditions we may expect benefit to result, and in what conditions no benefit may be looked for. This the author has most successfully attempted here, and he gives us records of many cases treated by himself and by others, pointing out its suitability or unsuitability as the case may be. As a general rule, the best results are got from superficial affections, although deep-seated conditions may also react favourably.

He begins by giving us a short description of the principle of the treatment. This is followed by a chapter on the practical details and method of applying the electrodes, &c. In general a solution of a strength of 1 per cent. is suitable for all ionic applications. The metallic ions mostly used are zinc, copper, mercury, and silver, and of these the first is the best.

The treatment of neuralgia is discussed in Chapter V. Trigeminal neuralgia yields best to the salicylic ion, although post-herpetic cases are less favourable, and are sometimes unaffected. They may, however, benefit more by quinine ions. Brachial neuritis usually responds well, but long sittings are required to ensure a reasonable depth of penetration. The treatment of sciatica is rendered difficult by the distance of the nerve trunk from the surface. The best results have been obtained by the use of large currents and long applications. Gouty neuritis and perineuritis respond well to the salicylic ion, as also do acute and subacute rheumatism. Rheumatoid arthritis does not react to this treatment, or if so, the relief is slight or temporary. Spondylitis deformans appears to benefit from the salicylic ion, the rigidity becoming less, and the movement actually returning. Lumbago usually responds well. The treatment of facial paralysis by salicylic ionisation is, according to the author, to be preferred to the ordinary electrical treatment, improvement being more rapid.

The remaining chapters deal with the other conditions which are suitable for treatment. There is a good index. We might just refer to the fact that Dr Rows' name has been accidentally misspelt on p. 106.

The book is to be strongly recommended to all those interested in ionic medication, as it gives a short and concise statement of the main points requiring to be known by anyone who wishes to understand this increasingly important line of treatment.

**PAPERS ON PSYCHO-ANALYSIS.** ERNEST JONES, M.D., M.R.C.P. (678) (Lond.), Associate Professor of Psychiatry, University of Toronto. Pp. 432. Baillière, Tindall, & Cox, London. Pr. 10s. 6d. net.

UNDER this title Professor Jones has gathered together a book from a number of papers, the majority of which have already been published in various psychological journals. The papers, which have been arranged in five groups, give a most interesting insight into this important branch of psychiatry, which has been largely neglected by British investigators.

The author, who is one of the foremost exponents of psycho-analysis, produces considerable evidence which goes far to prove how much can be done by careful investigation to elucidate the nature of those complex mental conflicts in which psychoneuritic symptoms take their origin.

The chapters on the investigation and treatment by psycho-analytical methods are full of interest, and the illustrations of the way in which these investigations are carried out make the volume exceedingly helpful in getting an accurate knowledge of the procedure to adopt.

No work on such a subject would be complete without reference to Freud's important and original investigations, and a short account is given of that author's important "Theory of Sex," and its application in the determination of neuroses. The criticisms which have been advanced against Freud's views are well dealt with. Another chapter of considerable interest is that in which the same author's "Theory of Dreams" is discussed.

All who have any interest in psycho-analysis, or who purpose making a study of this subject, will be well advised to procure Professor Jones' book, which we can confidently recommend as a clear exposition of this rather complex subject.

#### BOOKS AND PAMPHLETS RECEIVED.

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Villiger, Emil. "Brain and Spinal Cord. A manual for the study of the morphology and fibre-tracts of the central nervous system," translated by George A. Piersol from the third German edition. J. B. Lippincott Co., London and Philadelphia. Pr., 16s. net.

# Review of Neurology and Psychiatry

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## Original Articles

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### DIRECT TROCHLEAR AND CROSSED OCULOMOTOR FIBRES.

By LEONARD J. KIDD, M.D.

1. *Preliminary*; 2. *Embryological Evidence*; 3. *Anatomical Evidence*; 4. *Pathological Evidence*; 5. *Experimental Evidence*; 6. *The Alleged Mechanism of Lateral Conjugate Eye-Movements*; 7. *The Meaning of Direct and Crossed Fibres in the Fourth and the Third Cranial Nerves*; 8. *The Neurology of the Sterno-Mastoid Muscle in Associated Conjugate Contralateral Eye-Movements*; 9. *Needed Experimental Procedures*; 10. *Conclusions*; 11. *References*.

#### 1. PRELIMINARY.

PRACTICALLY all modern observers are agreed that some of the fibres of the oculomotor nerve rise in cells of the opposite oculomotor nucleus, and there is also incontrovertible evidence that some fibres of the trochlearis nerve rise in the cells of the homolateral trochlearis nucleus. Conflicting accounts have been given of the muscular destination of the crossed oculomotor fibres, none of which, in my opinion, arrives at the whole truth. Of these various schemata that of Bernheimer seems to have found most favour, and it has even found its way into some text-books. But I shall not waste time by discussing in detail any of these, because our knowledge of the cortico-nuclear path shows conclusively that none of these schemata would be capable of working the various conjugate eye-movements of mammals as we know them. It will be best to begin with the embryological evidence which proves

the existence of direct trochlear fibres, because the work of Paul Martin gives us the clue to their understanding, and also to the meaning of crossed oculomotor fibres. Martin's work seems to have entirely escaped the notice of all workers hitherto, with the shining exception of the professional embryologists.

The view of Gaskell needs no detailed scrutiny: it is ingenious, erroneous, and, if I may use an Irishism, it was disproved (by Martin and by Froriep) before it was published. It is to be remembered that Gaskell accepted the current teaching of his day that all trochlear fibres are crossed. Professor Arthur Robinson, writing in Morris' "Anatomy," 3rd edition, 1902, p. 844, went so far as to write thus:—"Gaskell has *shown* (italics are mine) that this condition has probably been brought about phylogenetically by the transference of the muscles which have carried their nerves with them." But I am glad to find that Professor Irving Hardesty alters this in the 4th edition, Part 3, p. 963, to the words, "Gaskell has suggested," a very different statement, and one which has the advantage of being correct.

## 2. EMBRYOLOGICAL EVIDENCE.

So long ago as the year 1890 Paul Martin<sup>1</sup> found that in cat embryos the trochlearis nidulus (embryonic nucleus) sends out its neuroblasts on the same side, *whereas its crossed neuroblasts are later in appearance*. What a comment this is on the erroneous and really ludicrous dogmatism of the text-books! Not only have we all been wrong in saying that all trochlear fibres are crossed, but these crossed fibres are not the primitive ones, although in the course of phylogenetic development they greatly preponderate in numbers over the primitive, direct trochlear fibres. Martin found also that the ventral position of the trochlearis nidulus, which His, in 1888, described in human embryos, was not the primitive position in the cat; the neuroblasts in the cat embryo lie at first higher up the lateral wall of the neural tube, and later migrate to the ventral position as described by His for the human embryo. The significance of this fact will be obvious to those readers who are widely read in the literature of the development of the trochlearis and oculomotorius nerves. These facts, discovered by Martin in cat embryos, are of more importance than may appear at the first sight; for the cat presents in its ontogeny many traces of its antiquity of origin. Practically all modern palæontologists and zoologists tell us that carnivores are descended directly from the extinct *Creodonta*, which are known to have been of a very primitive

mammalian type. Osborn \* states that the *creodonta* appear first in the lower (basal) eocene, *i.e.*, just after the age of reptiles.

Soon after Martin made his ever-memorable discovery, Froriep<sup>2</sup> observed in young embryos (16 m.m.), of the elasmobranch, *Torpedo ocellata*, that the trochlearis nerve receives fibres from both trochlearis niduli.

We may then sum up the evidence, the importance of which cannot be overrated, by saying that in two vertebrate forms, one a very ancient one, the other a more modern one which shows, however, traces in its ontogeny of its ancient origin, we have proof of the existence of direct trochlear fibres, and of the fact that in one of them the direct trochlear fibres are the primitive ones. Although I shall have to refer presently to certain other embryological studies, it will be more convenient to include them in the section dealing with anatomical evidence: this applies chiefly to the third nerve, but also to the fourth. And let us remember that no embryologist has ever found that crossed oculomotor fibres are primary: it is as true of the oculomotor nerve as it is of the trochlear nerve that the direct fibres are primary, the crossed are secondary: there is, however, one exception to this, I believe, *viz.*, in the case of the fibres which the oculomotor nerve sends to the internal rectus muscle: I shall refer to this question in section 7 of this paper.

### 3. ANATOMICAL EVIDENCE.

DUVAL<sup>3</sup> mentions in his second paper, written in 1880, p. 296, that the idea of a partial decussation of the oculomotor nerve is an ancient one: thus, this opinion was held as long ago as the year 1591 by Varolius, and was later supported by Riolan (1649), Vieussens (1685), and Vicq d'Azyr (1805); but was denied by Longet (1842). It was revived by Vulpian and Philippeaux (1853) for mammals, including man. But Gratiolet (1857) failed to confirm this, as also did von Kölliker in 1868 and Forel in 1877. Duval and Laborde<sup>4</sup> state that, in 1877, in studying longitudinal sections of the pons and bulb of a cat, they were struck by the presence of some nerve-bundles which seemed to establish a crossed connection between the nerve of the sixth pair with that of the third pair. Duval concluded, from his studies in the chick and in

\* "The Age of Mammals," by H. F. Osborn, New York, 1910 (the Macmillan Company).

man, that the third nerve presents no decussation; yet he held that it contains some crossed fibres which enter it from the contralateral sixth nucleus by way of the posterior longitudinal bundle. Duval and Laborde described in the monkey fibres passing from the sixth nucleus towards the third nerves, and also others which go to the fourth nerves. But their work is not at all convincing.

PERLIA<sup>5</sup> (1889) found a partial crossing of the fibres of the third nerve in all the mammals which he examined, viz., in calf, pig, sheep, and mouse; also in chick and in frog.

VON KÖLLIKER<sup>6</sup> (1892) found a similar partial crossing in the oculomotor nerve in a human embryo and also in the adult: these crossed fibres come from the dorsal part of the opposite oculomotor nucleus; but he could not exclude the possibility that some crossed fibres may also come from the ventral part of that nucleus.

VAN GEHUCHTEN<sup>7</sup> (1892), working by the Golgi method in an embryo of the duck of fourteen days' incubation (he studied chick embryos also), found some crossed fibres in the oculomotor nerves. These are very clearly figured: they rise in both the ventral and the dorsal parts of the opposite oculomotor nucleus, and pass out chiefly in the median part of the oculomotor nerve.

EDINGER<sup>8</sup> (1893) described crossed fibres in the human oculomotor nerve, coming from the dorsal part of the hinder part of the contralateral oculomotor nucleus.

OBERSTEINER<sup>9</sup> (1892) found essentially the same facts as Edinger.

VON BECHTEREW<sup>10</sup> (1897) found a few crossed fibres in the oculomotor nerve of a human embryo, coming from the dorsal part of the caudal end of the opposite oculomotor nucleus.

FRANZ<sup>11</sup> (1911) found that in all the bony fishes which he examined, amounting to a dozen or more varieties, the oculomotorius root-bundles are partly crossed: in one only, *Ereocetus volitans*, was the crossed bundle very small.

We have, then, anatomical evidence of the existence of crossed oculomotor fibres in fishes, amphibia, birds, and mammals up to man; and it is important to note that these have been traced to the contralateral oculomotor nucleus by von Kölliker, van Gehuchten, Edinger, and Obersteiner.

OBERSTEINER<sup>9</sup> (1892) describes some fibres of the trochlearis nerve as passing ventralwards in traversing the posterior longi-

tudinal bundle: he thought that a certain number of these fibres curve back to join the homolateral trochlearis nerve, whilst the majority pass across the raphe. But von Bechterew<sup>10</sup> (1897) failed to demonstrate the existence of any direct trochlear fibres, as also did Cajal<sup>12</sup> (1900) in rat, rabbit, and cat; Bernheimer<sup>13</sup> also failed in a human embryo.

FRANZ<sup>11</sup> (1911) describes and figures both crossed and uncrossed trochlearis roots in bony fishes.

McKIBBEN<sup>14</sup> (1913) has carefully studied the eye-muscle nerves of twenty-five adult specimens of the urodele *Necturus maculosus* by the *intra vitam* methylene blue method: he found great variations in the trochlearis nerve, even occasionally in a single specimen on the two sides of the head: its root contains from sixteen to twenty-four fibres; out of these fibres from four to eight "seem to enter the nerve uncrossed; on careful examination under high magnification these fibres seem to be larger than those which make up the trochlear nerve, and to belong to the mesencephalic root of the trigeminal nerve which lies here beneath the trochlear nerve." It seems to me that although these observations are in some respects very puzzling, yet they may possibly mean that *necturus* has a relatively unusually large number of direct trochlear fibres: but we cannot at present feel certain on this point. We must wait for further observations on its trochlearis nerve and its component fibres. It will be noted that McKibben writes throughout with great caution, as the passage quoted by me above shows: we have to bear in mind also the great variations of the trochlearis in this amphibian. One point, however, needs mention: we know that *Necturus* shows a very large number of ancient characteristics in its neurology: one has only to point to the work of Kingsbury, Julia Platt, Johnston, and many other American comparative neurologists who have so thoroughly worked out a large part of the anatomy and development of its nervous system. We should expect, then, that this very ancient urodele should show a relatively high proportion of direct trochlear fibres. McKibben points out that its optic apparatus is poorly developed compared with that of some other urodeles. On the whole, then, it seems to me to be a fair provisional conclusion that *Necturus* has retained the primitive, ancestral conditions of its eye-muscle nerves, and represents an ancient type of vertebrate which has not yet acquired a relatively large number of crossed trochlear fibres.



## 4. PATHOLOGICAL EVIDENCE.

SIEMERLING and BOEDEKER<sup>15</sup> (1897) found evidence of the existence of crossed oculomotor fibres coming from the ventral cells of the contralateral oculomotor nucleus. They also found degenerated cells in both trochlearis nuclei in a case where only one superior oblique muscle of the eyeball was paralysed.

SIEMERLING and WESTPHAL<sup>16</sup> (1891) described the trochlearis nucleus as composed of two parts, (1) a distal part which alone gives origin to fibres which cross in the valve of Vieussens, and (2) a proximal part whose fibres cross the raphe and enter the contralateral oculomotor nerve!

## 5. EXPERIMENTAL EVIDENCE.

The chief experimentalists who have found evidence of the existence of crossed oculomotor fibres are the following:—

VON GUDDEN<sup>17</sup> (1881-85), using his own method in newly-born rabbits, found that the crossed fibres of the oculomotor nerve come from the cells of the dorsal part of the contralateral oculomotor nucleus, and the direct fibres from the ventral part of the homolateral oculomotor nucleus.

SPITZKA<sup>18</sup> (1885) found evidence of crossed oculomotor fibres in the cat.

BERNHEIMER<sup>13</sup> (1897) found, in the monkey, that crossed oculomotor fibres come from the caudal part of the contralateral oculomotor nucleus, and innervate the inferior oblique and the inferior rectus muscles.

VAN GEHUCHTEN<sup>7</sup> (1898, 1903) found evidence of crossed oculomotor fibres in rabbits; in his 1903 paper he speaks of the great difficulty of performing intra-orbital avulsion of one or other of the three ocular nerves in the rabbit: he therefore enucleated the globe of the eye with the soft parts in two rabbits: he found that crossed oculomotor fibres come from the caudal three-fifths of the contralateral oculomotor nucleus.

VAN BIERVLIET<sup>19</sup> (1899) found in rabbits that, after extirpation of the globe of one eye, chromolysis of some of the cells of the dorsal part of the caudal three-fifths of the contralateral oculomotor nucleus occurred. He attempted also, in a series of rabbits, to perform an isolated section of each muscular branch of the oculomotor nerve on one side; he found that section of the branch

to the inferior oblique muscle was very easy, but that of the three other muscular branches of the oculomotor nerve was much more difficult. (In the rabbit the branch to the superior rectus apparently supplies also the levator palpebræ superioris muscle.) His exact mode of operating is described on pp. 20-22 of his paper. He concluded that the rectus inferior, rectus internus, and obliquus inferior receive a few crossed fibres; and the superior and levator palpebræ superioris ("probably") none but crossed fibres. He mentions that several of his conclusions agree with the earlier experimental findings of Bach. He also showed incidentally, as van Gehuchten<sup>7</sup> did in 1898, that the intrinsic muscles of the eyeball are innervated exclusively by direct fibres from the oculomotor nucleus. In my opinion van Biervliet's findings must be regarded with great suspicion, for these reasons:—he says it is very easy to divide the nerve-branch to the inferior oblique, and impossible to perform isolated section of the branch to the inferior rectus, on account of its close proximity to the branch to the inferior oblique; he therefore contented himself with section of the nerve-filaments destined for these two muscles. When he performed this joint section, he found later five or six chromolysed cells in the contralateral oculomotor nucleus; he had previously found only one chromolysed cell in that nucleus after isolated section of the branch to the inferior oblique. One would naturally have concluded from these two separate findings that both the inferior oblique and the inferior rectus receive some crossed fibres, the larger number being received by the inferior rectus. But van Biervliet writes the following astounding passage:—"These (chromolysed) cells appear to us to be exclusively connected with the inferior oblique. It follows that the fibres which innervate the rectus inferior are all direct." I fail entirely to grasp the logic of this statement, and it is actually contradicted by van Biervliet himself in his list of conclusions (pp. 28, 29), where he states that the rectus inferior, rectus internus, and obliquus inferior are innervated mainly by direct fibres, but apparently also by some crossed fibres. In addition, as he admits that isolated section of the nerve-filaments going to the internal, inferior, and superior recti muscles is very difficult of performance in the rabbit, it seems a great pity that he omits to say whether the fact of such isolated section was in each case verified on autopsy.

BACH<sup>20</sup> (1906) performed avulsion of the ocular muscles in

rabbits, cats, and monkeys: after keeping his animals for seven or eight months he found evidence that some of the fibres of the oculomotor nerve come from the contralateral oculomotor nucleus. (van Biervliet (1899) had previously objected to the avulsion method as being liable to cause a lesion of neighbouring nerve-filaments going to other muscles; and, in connection with Bach's earlier experiments, van Biervliet points out that Bach's method of dividing the muscle and extirpating only its peripheral part, while its central part is left intact, is liable to fail to divide all the nerve-fibres going to the muscle.)

VAN DER SCHUEREN<sup>21</sup> (1909) carried out a very thorough experimental research on the ocular nerves of the rabbit: he found that the oculomotor nerve contains some crossed fibres which come from the caudal three-fifths of the dorsal part of the contralateral oculomotor nucleus. But he did not experiment on the question of the exact muscular destinations of these crossed fibres. On summing up this question, then, we see that there is a remarkable agreement among experimentalists that the crossed fibres of the oculomotor nerve come from the dorsal part of the caudal end of the contralateral oculomotor nucleus. And I shall show in section 6 of this paper that we have experimental proof of an overwhelmingly strong character that none of the crossed fibres of the third nerve come from the cells of the contralateral sixth nucleus.

Some six experimentalists have attacked the problem of the exact nuclear origin of all the motor fibres of the fourth cranial nerve. Two of these observers have established in the clearest possible fashion the fact that it contains some direct fibres.

VON GUDDEN<sup>17</sup> (1881) found that, after extirpation of the three eye-muscle nerves of newly-born rabbits, there was complete atrophy of the contralateral fourth nucleus. He concluded that all the trochlear fibres are crossed, some of the oculomotor crossed, and all of the abducens nerve direct.

BREGMANN<sup>22</sup> (1892) failed to find evidence of the existence of direct trochlear fibres.

BERNHEIMER<sup>13</sup> (1897) found, in the monkey, that all the trochlear fibres are crossed.

VAN GEHUCHTEN<sup>7</sup> (1898) found that, after section of the rabbit's fourth nerve, chromolysis occurred in a few cells of the homolateral fourth nucleus. He confirmed the existence of a few

direct trochlear fibres in the rabbit in his later and fuller research in the year 1903.

BACH<sup>20</sup> (1906) described in rabbit, cat, and monkey a certain number of trochlear fibres as passing forward in the posterior longitudinal bundle and joining the roots of the oculomotor nerve! He thought this probably holds good for man as well!

VAN DER SCHUEREN<sup>21</sup> (1909) found that, after rupture of one trochlear nerve in rabbits, a few cells—a very careful count showed a dozen—were chromolysed in the homolateral trochlear nucleus; and a few normal cells were found in the contralateral trochlear nucleus. He found that the cells which give origin to the direct trochlear fibres were distributed, without any apparent order, throughout the whole extent of the trochlear nucleus. His work, therefore, confirms the previous findings of van Gehuchten (1898, 1903) that in the rabbit the trochlear nucleus sends a few direct fibres into the homolateral trochlear nerve.

#### 6. THE ALLEGED MECHANISM OF LATERAL CONJUGATE EYE-MOVEMENTS.

Before I attempt to discuss what I believe to be the meaning of the presence in the fourth and in the third cranial nerves of both direct and crossed fibres, it is essential to show that the widely accepted teaching that lateral conjugate eye-movements are carried out by virtue of fibres, which the sixth nucleus is alleged to send to the contralateral third nucleus or root for the innervation of the internal rectus muscle, is not only erroneous, but that it has been proved to be erroneous by the sure test of carefully planned and executed experimentation. The sixth nucleus theory is at least fifty-five years old, if not more; but it was brought into prominence by Duval and Laborde<sup>4</sup> in 1880: they were led to adopt it partly by their own experiments—which I will mention presently—and partly by Duval's anatomical studies mentioned by me in section 3 of this paper: in addition they were much influenced by certain cases of paralysis of lateral conjugate eye-movements, with preservation of the power of convergence. For convenience of description I shall speak of this sixth nucleus hypothesis as the Duval-Laborde hypothesis.

FÉRÉOL<sup>23</sup> (1877) recorded a case of loss of lateral conjugate movements of the eyes to the right, with preservation of convergence.

Autopsy showed a tuberculous focus near the origin of the right sixth nerve. Féréol, therefore, concluded that "it is possible that the internal rectus muscle receives its innervation from two sources, from the third pair for isolated movements (of convergence), and from the sixth pair of the opposite side for associated and synergic movements."

HUGHES BENNETT and SAVILL<sup>24</sup> (1889) recorded a case of permanent conjugate deviation of the eyes and head. They called it "the result of a lesion limited to the sixth nucleus." A woman of 67 died three months after the onset of her first symptoms, and one month after the sudden onset of her ocular phenomena. On autopsy, a small patch of softening, measuring about one-tenth of an inch, was found "occupying the position of the left sixth nucleus and limited to it without apparently involving the neighbouring structures, such as the facial fibres (Fig. 1). Otherwise, to the naked eye, the appearances of the pons and medulla were normal. These, with the cord and other nervous structures, were reserved for subsequent and more complete examination, but, unfortunately, owing to a mishap, they were destroyed." . . . "The only structures which were not lost were the two sixth nerves. Microscopically, the right sixth nerve was perfectly healthy. The left, here and there, showed slight traces of degenerative atrophy." The worthlessness of such an imperfect pathological study must be obvious to everyone: it is the merest assumption on the part of the authors to say that the lesion was limited to the sixth nucleus: we have no information as to the presence or absence of degeneration in the posterior longitudinal bundle. We now know that this bundle contains ascending vestibulo-ocular fibres, all of which pass up close to the sixth nucleus and some of them through it. A gross lesion, then, which involves the sixth nucleus, involves also, of necessity, some of the ascending vestibulo-ocular fibres.

GEE and TOOTH<sup>25</sup> (1898) published a case which was carefully studied pathologically by the Marchi method. It was one of bilateral loss of lateral conjugate eye-movements in a woman of 21, but loss of convergence was also present, so that the case does not strictly come within the category now under consideration. On autopsy, a hæmorrhagic focus was found in the pons at about the junction of its middle and lower third. Almost the whole of the right sixth nucleus was destroyed; the left sixth nucleus was "only slightly, if at all, affected, and probably only by pressure"; both posterior longitudinal bundles were degenerated, the right more than the left; "the cells of the right fourth nucleus natural, but it is pervaded with degenerated fibres, no doubt derived from the posterior longitudinal bundle. The third nucleus is full of degenerated fibres running in every direction. Among the roots of the third nerve we find a fair number of degenerated fibres, more on the left side than on the right." Now this case obviously lends no real support to the Duval-Laborde hypothesis, as Gee and Tooth clearly recognised, I think; thus, they wrote on p. 15:—"The connection between the symptoms and the condition of the sixth nuclei presents certain difficulties. The practically complete destruction

of the right sixth nucleus perfectly explains the loss of power of conjugate deviation to the right. But the patient is noted to have had equally complete conjugate paralysis of movement to the left, while the left sixth nucleus is uninjured." They suggested (in my opinion quite rightly) that "it may be regarded as possible that a lesion involving the division of the posterior longitudinal bundle on both sides would result in paralysis of conjugate deviation on both sides, even though the sixth nuclei were unaffected."

SPITZER<sup>26</sup> (1899) \* described a typical case of conjugate deviation of the head and eyes as the result of a tuberculous focus developing in the dorsal part of the pons. The tumour occupied especially the left side: it destroyed the dorsal part of the raphe and part of the right posterior longitudinal bundle. On the left side it extended to the nucleus of Deiters, and ventrally to the superior olive. Above the level of the tumour the degeneration occupied the ventral and median part of the posterior longitudinal bundle: it can be followed to the level of the fourth and the third nuclei: the root-fibres of these nerves were intact. This case needs no comment, in view of the presence of degeneration in the posterior longitudinal bundle.

BRUCE<sup>27</sup> (1903) studied very carefully, clinically and pathologically, a case of double paralysis of the lateral conjugate deviation of the eyes, due to a pontine tumour which occupied the position of the two sixth nuclei and the two seventh nerves: it extended to the nucleus of Deiters, but did not destroy it. The tumour involved the left side of the pons rather more than the right: ascending and descending degenerations were found in the posterior longitudinal bundle, the ascending degeneration being very well seen in both bundles. Bruce concluded that "it must be admitted as being beyond doubt that the posterior longitudinal bundle does contain ascending fibres." A passage that follows almost immediately (p. 337) has been seriously misunderstood, I think, by Van der Schueren (1909). Thus the latter writer<sup>21</sup> quotes Bruce to the effect that:—"It must be borne in mind that any ascending degeneration within the upper part of the posterior longitudinal bundle resulting (from a destructive lesion) † of the sixth nucleus, must contain fibres which emanate from the nucleus of Deiters as well as those which originate in the sixth nucleus itself." Van der Schueren then goes on to say (p. 151):—"Bruce, then, seems to admit that these fibres, rising in the sixth nucleus, terminate in the cells of origin of the mesencephalic nerves, chiefly the oculomotor." But it is evident that Bruce did not blindly accept the Duval-Laborde hypothesis, but on the contrary approached the problem with a clear understanding of its nature. Thus he wrote,<sup>27</sup> p. 337, the following passage in brackets:—"Indeed, a further investigation by means of Nissl's method of the condition of the cells of this nucleus (sixth) after section of the posterior longitudinal bundle between it and the third nucleus is necessary to determine with absolute certainty whether

\* Cited by van der Schueren<sup>21</sup> (1909).

† The words in brackets are omitted by van der Schueren, doubtless by a slip.

they give rise to any ascending fibres." I will show presently that van der Schueren himself has performed this very experiment suggested by Bruce, and has succeeded in proving that the Duval-Laborde hypothesis is erroneous, so far, at any rate, as the rabbit is concerned. A very striking case, which I will now mention, proves that it is erroneous for man also.

SIEMERLING and BOEDEKER<sup>15</sup> (1897) denied the existence of a lateral conjugate eye-movement centre in the sixth nucleus. They recorded a case of bilateral degeneration of the sixth nuclei, in which, during life, there had been no paralysis whatever of the internal recti muscles. We can no longer, then, hold that in man the sixth nucleus sends any fibres to the contralateral third nucleus or root for the conjugate inward movement of the internal rectus muscle in the associated lateral eye-movements.

DUVAL and LABORDE<sup>4</sup> (1880) performed stimulation and destruction experiments in the region of the eminentia teres, chiefly in dogs, but also in cats and monkeys: they obtained by these means various deviations of the eyes. But their experiments cannot be taken seriously, for they actually believed that their stimulation and destruction was limited to the sixth nucleus. We know now, thanks to the labours of many experimenters up to van der Schueren<sup>21</sup> (1913), that ascending vestibulo-ocular fibres pass up in the posterior longitudinal bundle, some of which pass through the sixth nucleus. Obviously, therefore, Duval and Laborde's experimental procedures involved these ascending fibres as well as the sixth nucleus.

VAN DER SCHUEREN<sup>21</sup> (1909) established the following facts in rabbits:—(1) After section of the third, fourth, and sixth nerves on one side he found, a few days later, that there was chromolysis of all the cells of the homolateral sixth nucleus, and none whatever in the contralateral one: it is obvious that, if the sixth nucleus sent any fibres to the contralateral third nucleus or root, he would have found chromolysis of some of the cells of the sixth nucleus on the side opposite to his section of the third nerve. (2) Section of one sixth nerve was followed by chromolysis of all the cells of the homolateral sixth nucleus: therefore all the cells of the sixth nucleus give origin to root-fibres of the homolateral sixth nerve. (3) He also established the facts that, in the rabbit, (a) the posterior longitudinal bundle in its course between the level of the sixth nucleus and the fourth and third nerves contains ascending fibres which are connected with the cells of the homolateral fourth and third nuclei, and (b) that bundle does not contain

any fibres which pass into the peripheral part of the fourth or third nerve of either side, (c) the sixth nucleus sends no fibres into the posterior longitudinal bundle, and (d) no neurones connect the sixth nucleus with the fourth and third nuclei. In his recent paper (1913) on the posterior longitudinal bundle he again proves the falsehood of the Duval-Laborde hypothesis for the rabbit.

We may sum up the question thus:—(1) In all those cases of loss of lateral conjugate eye-movement, accompanied by preservation of the action of the contralateral internal rectus muscle in convergence, which have been carefully examined pathologically, we find evidence of the presence of degenerated fibres in the posterior longitudinal bundle; (2) the case of Siemerling and Boedeker<sup>15</sup> directly negatives the Duval-Laborde hypothesis for man; (3) experiments show that all the cells of the rabbit's sixth nucleus are radicular; it sends no fibres into the posterior longitudinal bundle to the contralateral oculomotor nucleus or root; (4) whatever may be the mechanism of the lateral conjugate eye-movements of man and the rabbit, so far as the brain-stem is concerned, it is not by means of the Duval-Laborde fibres, for such fibres have no existence. So long ago as the year 1892, van Gehuchten<sup>7</sup> expressed the opinion that the posterior longitudinal bundle seems to be sufficient to carry out the lateral conjugate eye movements by means of the fibres which pass in that bundle to the various ocular nuclei. Many other authors have held the same opinion, and we can have no reasonable doubt that it is the correct one.

We ought all to grasp the vitally important truth that there are only two kinds of lesions which can cause effects anatomically and functionally limited to the cells of the sixth nucleus, viz., (1) a slow, primary degeneration of its cells, and (2) a retrograde, secondary degeneration of its cells due to a lesion of the homolateral sixth root or nerve. All gross lesions, such as tumour, softening, hæmorrhage, etc., which involve one sixth nucleus, involve also of necessity some of the ascending vestibulo-ocular fibres. A lesion, then, which is strictly limited to the cells of one sixth nucleus, gives exactly the same clinical picture as one which involves the motor fibres of the sixth root or nerve; but a combined lesion of the sixth nucleus and the posterior longitudinal bundle gives rise to loss, or diminution, of lateral conjugate eye-movement to the side of the involved sixth nucleus, with or without (most com-



monly with) preservation of the convergence action of the contralateral internal rectus muscle. And, finally, let us not forget that, if the Duval-Laborde hypothesis were true, we should find in every case of experimental section of one third nerve, and in at any rate some cases of complete unilateral third nerve paralysis in man, that autopsy would show the presence of chromolysis in some of the cells of the contralateral sixth nucleus; but such changes have never been seen by any experimentalist or pathologist.

#### 7. THE MEANING OF DIRECT AND CROSSED FIBRES IN THE FOURTH AND THE THIRD CRANIAL NERVES.

Hitherto the fundamental error has been made of comparing the fourth nerve with the third nerve; and this, I believe, is the reason why both nerves have been misunderstood. We can understand how this mistake came to be made:—Dissection seemed to show that all the fibres of the third nerve are direct, and all those of the fourth nerve crossed. Naturally, therefore, descriptive anatomists seized on this apparent fact and taught that the fourth cranial nerve differs from all other nerves in being composed entirely of crossed fibres. Even when more exact methods proved the existence of direct trochlear and crossed oculomotor fibres, their meaning was quite misunderstood. Although Paul Martin's observations<sup>1</sup> gave all of us the hint twenty-three years ago, they fell on barren ground, for two reasons:—(1) It is not the function of the professional embryologist to worry out the clinical and anatomical bearings of his discoveries; and (2) apparently clinicians do not, for the most part at any rate, believe that the study of the literature of comparative neuro-embryology is the beginning of neurological wisdom. The true comparison is, I believe, between the fourth nerve and that branch of the third nerve which supplies the inferior oblique muscle. Probably almost everyone to-day believes that, although the lateral eyes of vertebrates are of vast antiquity, they were preceded in pre-vertebrate ancestors by a series of appendages—about six or seven—in the anterior region of the head; and the various muscles innervated by the third nerve belonged originally to many separate segments. And although I have chosen for this paper the title of "direct trochlear and crossed oculomotor fibres," yet for a proper understanding of the question we need to compare the crossed

fibres of the third nerve, not with the direct fibres of the fourth nerve, but with its *crossed* fibres. So that the apparently exceptional condition of the fourth nerve was arrived at originally in ignorance of the fact that all nerve-fibres, with the single exception of those to the internal rectus muscle of the eyeball, were primitively direct.

In the year 1904 I stated<sup>28</sup> the elementary truism that in the laterally placed lateral eyes of ancestral vertebrates the two oblique muscles were primitively purely wheel-rotators, and the upper and lower recti were purely vertical movers of the eyeball. At a later stage—which may have come quickly—the obliques and the two recti named received new fibres and new functions with the rise of inward movements of the eyeballs (strictly of the corneæ, of course); in adduction, then, the obliques became vertical movers and the two recti wheel-rotators. Now, primitively the two eyes moved independently of each other, and originally, each hemisphere governed the movements of the opposite eye: thus the upper nerve-path was crossed, the lower direct. We must conceive each separate field of fixation in this primitive animal as divided at an early stage of its development into a right and left half of the mid-line of vision of each eye. Probably the earliest possessors of lateral eyes were relatively defenceless animals, which sought safety in escape from their overtaking enemies. If that be admitted, the earliest eye-movements were backward movements performed by each posterior (external) rectus, aided for upward and backward movements by the superior rectus and inferior oblique, and for downward and backward movements by the inferior rectus and superior oblique. All this was performed by a crossed upper and a direct lower path. It follows that, as in abduction, the superior and inferior recti have much greater resistance to overcome in producing upward and downward movements than the obliques have to meet in producing wheel-movements, the number of direct fibres going to the two former muscles was of necessity far greater than was needed in the case of the obliques: hence the obliques received very few direct fibres, and the upper and lower recti a very much larger number than the obliques. But things were quite different when this primitive animal began to need adduction movements of each eyeball: these movements were really right-sided movements of the left eye and *vice versa*. It will be convenient to speak of a muscle as a homonymous muscle

when it carries out a movement on its own side, and heteronymous when it performs a movement on the opposite side. The upper nerve-path still remained a crossed one: therefore these adduction movements of each eye were governed by the homolateral hemisphere: obviously, therefore, a crossed lower path had to be evolved in order that these heteronymous muscular actions should be capable of performance. A little reasoning will show that the internal rectus muscle received crossed fibres, the two obliques a very large accession of crossed fibres, and the upper and lower recti a very small accession of crossed fibres; the reason for this was, of course, that in adduction the obliques have to contract against marked muscular resistance and, therefore, need a large number of crossed nerve-fibres, whereas the superior and inferior recti have very little resistance to overcome, and, therefore, need very few crossed fibres. Of course we all recognise that it is not easy to understand the exact stages by which the primitive independently acting eyeballs of lower vertebrates arrived at the conjugated actions of higher forms. But one thing is clear. If the upper path be entirely crossed, the lower path must be double in the case of the two obliques, and the superior and inferior recti: otherwise the eye-muscles would not be able to perform the various eye-movements of mammals as we know them. If, on the other hand, the upper path be double, a single nucleo-muscular path to these four muscles is sufficient. With regard to the internal rectus muscle, we have evidence that it does not receive any crossed fibres from the contralateral sixth nucleus. I feel convinced, however, that all its fibres are crossed; and that all its motor fibres come from cells of the contralateral third nucleus; my reason for this belief is, that it is entirely a heteronymous muscle, not only in the action of conjugate lateral eye-movements to the opposite side, but also in convergence. In the latter act the left internal rectus performs a right-sided movement, *i.e.*, it acts as a heteronymous muscle. It is believed that in man the cortico-nuclear path is entirely crossed: in the act of convergence then, each hemisphere governs the action of the homolateral internal rectus muscle by means of the crossed fibres which pass from the contralateral third nucleus to the muscle just named. The same thing happens in the actions of convergence below or above the horizontal plane: in these actions each hemisphere acts on the superior or the inferior oblique of its own side by means

of the crossed fibres which pass to these muscles from the fourth and the third nucleus respectively.

With regard to the levator palpebræ superioris muscle, the only reason I know of which suggests that it probably receives some crossed fibres from the contralateral third nucleus is the fact that electrical stimulation of a small area of the cerebral cortex gives slight movements of the homolateral eyelids. [I reject van Biervliet's finding<sup>19</sup> that all, or nearly all, of the fibres received by the levator palpebræ superioris are crossed, as it seems to me to amount to an absurdity].

If my reasoning in these matters be sound, the direct and crossed fibres in the various muscular branches going to the extrinsic muscles innervated by the third and fourth nerve would be arranged as follows:—(1) The oblique muscles receive a small minority of direct, a large majority of crossed fibres; (2) the superior and inferior recti a large preponderance of direct, a small minority of crossed fibres; (3) the internal rectus exclusively crossed fibres from the contralateral third nucleus; (4) the levator palpebræ probably a relatively small number of crossed fibres from the contralateral third nucleus. In the year 1910 I suggested<sup>28</sup> that any muscle which receives both direct and crossed motor nerve-fibres must receive also both direct and crossed muscle-afferent nerve-fibres. In the case of the muscle-afferents of the extrinsic muscles supplied by the third and fourth cranial nerves, one cannot doubt that they are grouped in each nerve-branch in exactly the same way as the motor fibres: thus, the muscle-afferents of the obliques are mainly crossed, with a few direct; those of the internal rectus all crossed; those of the external rectus all direct, and so on.\* Now, it is clear that my views here offered as to the muscular destinations of the various crossed fibres of the third nerve are contradicted by all experimenters who have attempted to solve this difficult question. Yet I quite fail to see how I can be wrong in this matter. If the upper nerve-path to the ocular nuclei were double there would be no need—I would even add no possible use—for any crossed trochlear or crossed oculomotor fibres. And yet we have evidence of crossed trochlear fibres even by the simple method of dissection, and of crossed

\* At my private suggestion the question of the ganglionic origin of all the eye-muscle afferents, both the postural and the algetic ones, is being most kindly taken up experimentally by a physiologist.

oculomotor roots and fibres in fishes, amphibia, birds, and mammals up to man. Indeed I feel sure that if a mechanical engineer were shown a model of the muscular attachments of the eyeballs, and were told that the upper nerve-path to the nuclei of these muscles is entirely crossed, he would inevitably come to the conclusions which I have here offered. I need hardly say that the active movements of the eyes in the mid-line of vision are carried out by the simultaneous active innervation of both cerebral hemispheres; and, further, in such an act as that of looking downward and outwards to the right side both hemispheres are acting in the following way: the left performs the active movements of six "prime movers" concerned, and the right cortex performs the active—but less obtrusively active—movements of the six "co-operative steadiers."\* It would follow from this that that cortex which is governing the active movements of the prime movers does so by means of direct fibres of the contralateral eye, and by crossed fibres of the homolateral eye. Exactly the opposite arrangement holds goods for the co-operative steadiers.

I feel convinced that our ignorance of the exact muscular destinations of the various crossed fibres of the third nerve, and that ignorance of the fact that the fourth nerve contains some direct fibres, often leads us astray in diagnosis. A few years ago I heard a very distinguished ophthalmologist relate the case of a man who showed an isolated complete paralysis of one superior oblique muscle, which came on suddenly during a paroxysm of coughing in pertussis. The surgeon diagnosed a hæmorrhage of the opposite fourth nucleus. Now, a complete lesion of one fourth nucleus would give a slight paresis of the homolateral superior oblique, together with an almost complete paralysis of the contralateral muscle. There can be no reasonable doubt that in this patient the hæmorrhage occurred within the sheath of the homolateral fourth nerve-trunk. I doubt whether there is any region in the body in which so many erroneous diagnoses are made as in the case of the ocular nerves and their nuclei. I have specially noticed, in a long clinical experience, that very young diagnosticians are very prone to diagnose nuclear lesions; but if we exclude supra-nuclear lesions, I believe that the vast majority

\* I prefer this term to that of "antagonists," because even the biceps and triceps cubiti muscles are never antagonistic, except in the case of the malingerer or the hysterical patient.

of ocular palsies are due to radicular or to radiculo-nuclear lesions, and only a small minority to nuclear lesions. A lesion of one-third nucleus, if it involves some, or all, of the cells of the dorsal part of its caudal three-fifths, must of necessity give some crossed ocular palsies. If we all did a great deal more anatomical thinking in our clinical work, we should be less ready to diagnose glibly a third nuclear lesion.

#### 8. THE NEUROLOGY OF THE STERNO-MASTOID MUSCLE IN ASSOCIATED CONJUGATE CONTRALATERAL EYE-MOVEMENTS.

In the year 1910 I stated<sup>28</sup> that there were reasons which suggest that the sterno-mastoid muscle must receive both direct and crossed nerve-fibres. Some eight or nine years ago I read somewhere that it has been shown that the upper nerve-path for this muscle is wholly crossed. If this be correct, it must then receive some crossed fibres, because it is both a heteronymous and a homonymous muscle. Thus, the left sterno-mastoid is a homonymous muscle when it helps the other muscles of the left side of the neck to incline the left ear to the left shoulder: this action is performed by the right cerebral cortex acting by crossed cortico-nuclear fibres on the cells of the left upper cervical cord-segments, which, in their turn, act by the direct fibres which they send to the left muscle. But the left muscle is a heteronymous muscle when, either alone or in conjunction with eye-movements to the right side, it turns the face to the right: and this action is performed by the left cortex acting on the right side of the spinal cord, which, in its turn, acts by means of the crossed motor fibres which it presumably sends to the left sterno-mastoid muscle. If the path just mentioned be denied, then we are logically driven to the conclusion that the upper path for the muscle must be double. It is difficult to say whether the muscle receives a large majority of crossed fibres, because both of its actions are powerful ones, as we can feel on ourselves digitally against resistance. On the whole, however, it seems probable that it is mainly a heteronymous muscle, and therefore receives a majority of crossed fibres. In both respects it would, of course, resemble the two oblique eye-muscles. So far as I know, no experimentalist has yet made a careful study, by the retrograde chromolysis method, of the question whether the muscle receives any crossed motor fibres.

And the fascinating question of the ganglionic origin of the muscle-afferents of the sterno-mastoid muscle—and indeed of other neck muscles also—is still an untouched field of inquiry waiting for an enterprising physiologist.

Some observers, such as Edinger (1900) and Obersteiner (1901), have held that some spinal nerves contain crossed fibres. But van Gehuchten<sup>7</sup> (1902) found that, after rupture of the eighth cervical and first thoracic ventral and dorsal roots in the rabbit, he got no evidence that any of their fibres are crossed; and again in 1903 he mentions<sup>7</sup> that he obtained the same negative results by (1) the Golgi method, (2) after amputations, (3) by his own indirect Wallerian degeneration method: he thinks it is probable that all spinal nerves contain direct fibres only. But it seems to me clear that the neurology of the sterno-mastoid muscle is badly in need of a carefully-planned experimental study.

#### 9. NEEDED EXPERIMENTAL PROCEDURES.

Although one would, for the sake of making assurance doubly sure, welcome a renewed inquiry as to the destination of the axons of all the cells of the trochlear and abducent nuclei, the chief point we need light upon is the exact nuclear origin of the motor fibres in the various muscular branches of the oculomotor nerve, and their exact muscular destinations. I have said enough on the neurology of the sterno-mastoid muscle in section 8 of this paper. So far as the eye-muscle nerves are concerned, I regard the rabbit as easily the worst of all laboratory animals for such an experimental inquiry, for these reasons: it is a primitive, defenceless animal; it spends nearly all its life underground (in the wild state); it probably uses its ocular adduction mechanism much less than carnivora; and its optic axes are amongst the most divergent of all mammals. It will be remembered that in 1901 G. Lindsay Johnson\* showed that man and the true *simiæ* alone have the power of convergence, and alone have parallel vision; the domestic cat has a divergence of the optic axes of only seven to nine degrees; dogs one of fifteen to twenty; whereas the hare has one of eighty-five degrees. (It is probable that the rabbit closely resembles the hare in this respect.) I suggest, therefore, that the best animals for the inquiry are the monkey, cat, and

\* *Phil. Trans. Roy. Soc.*, Vol. B. 194, p. 1. (See especially Plate 30.)

dog, in that order. The chief experimental procedures needed seem to be Von Gudden's and the retrograde chromolysis methods. It is of course vitally important that a most searching inquiry should be made on autopsy to prove whether the lesion was entirely confined to the nerve-branch which was cut at the time of operation. (Unfortunately, the neuro-pathologist is seldom likely to have an opportunity of adding substantially to our present imperfect knowledge of this subject, as isolated lesions of single muscular branches of the third nerve do not often come to autopsy.)

#### 10. CONCLUSIONS.

1. We have embryological, experimental, and pathological proof of the existence of direct (uncrossed) trochlearis fibres, ranging from the ancestors of elasmobranch fishes up to man.

2. Direct trochlear fibres are few in number: the crossed have increased enormously in the course of phylogenetic development. In cat embryos direct trochlear neuroblasts are primary, the crossed are secondary (Martin).<sup>1</sup>

3. We have anatomical, experimental, and pathological proof of the existence of crossed oculomotor roots and fibres in fishes, amphibia, birds, and mammals up to man.

4. All the fibres in each muscular branch of the oculomotor nerve—with the exception of that to the internal rectus muscle—were primitively direct; their crossed fibres are secondary.

5. The writer believes that the direct and the crossed fibres of the oculomotor nerve are distributed as follows: the inferior oblique receives a few direct and a large preponderance of crossed fibres; the superior and the inferior recti mainly direct fibres, with a few crossed; the internal rectus exclusively crossed fibres, all of which come from the contralateral oculomotor nucleus; the levator palpebræ superioris probably a large majority of direct, and a small minority of crossed fibres.

6. In all ocular nerves and nerve-branches the grouping of the muscle-afferent nerve-fibres corresponds exactly with that of the motor fibres in that nerve or branch: thus the obliques have mainly crossed, the external rectus wholly direct, and the internal rectus wholly crossed fibres, etc., etc.

7. There are no fibres in man or the rabbit going from the



abducens nucleus, *via* the posterior longitudinal bundle, to the contralateral oculomotor nucleus or root.

8. The lower (infra-cortical) mechanism for the lateral conjugate eye-movements depends on the ascending vestibulo-ocular fibres of the posterior longitudinal bundle.

9. A lesion strictly limited to the cells of one abducens nucleus gives exactly the same signs as one of the abducens root or nerve, viz., a palsy of the homolateral external rectus muscle.

10. A complete cellular lesion of one trochlearis nucleus gives bilateral signs, viz., a slight paresis of the homolateral superior oblique muscle, with an almost complete paralysis of the contralateral superior oblique.

11. Great caution is needed in diagnosing nuclear oculomotor lesions on account of our gross ignorance of the exact muscular destinations of the axons of all its cells.

12. The sterno-mastoid muscle probably receives a majority of crossed fibres, a minority of direct; this applies both to its motor and its muscle-afferent fibres.

13. A renewed experimental study is needed in monkey, cat, or dog: the rabbit should not be used.

14. As the upper path from the cortex cerebri to the nuclei of the eye-muscle nerves and to the nuclei of the motor nerves of the sterno-mastoid muscle is believed to be wholly crossed, the lower path has to be a double one to the two obliques and the upper and lower recti muscles of the eyeball, and also to the sterno-mastoid muscle. If it were not so, the eye-movements could not be carried out in the way we know they are performed. If, however, the upper path were double, a single lower path would be sufficient, and there could then be no possible need for any crossed fibres in either the oculomotor or the trochlearis nerve.

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- <sup>27</sup> BRUCE, A.—  
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- <sup>28</sup> KIDD, L. J.—  
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 (a) October, p. 601.  
 (b) November, pp. 682, 683.

## Abstracts.

### ANATOMY.

**THE NERVE SUPPLY OF THE DENTINE.** J. HOWARD MUMMERY,  
 (479) *Proc. Roy. Soc. Med.*, 1913, v., July (Odontol. Sect.), p. 166.

THE nerves of the dental pulp lose their medullary sheath and neurilemma just beneath the odontoblast layer, and are seen to form an intricate plexus of neurofibrils in this situation, the plexus of Raschkow; from this plexus they pass in approximately straight lines between and around the odontoblast cells, and form another much narrower plexus at the inner margin of the dentine, which has been called the "marginal plexus." They very closely envelop the cells and the dentinal fibril, and enter the dentine in company with the latter. They can be traced as fine beaded fibrils all along the tubes and their very numerous branches, and are seen to terminate in the fine ramifications of the dentinal tubes beneath the enamel and cementum. Whether they actually pass into the enamel in places where the tubes penetrate this tissue cannot at present be said, but in any case, their normal and principal final

distribution is within the limits of the dentine. They are apparently very evenly distributed around the larger portion of the pulp, becoming scattered, although not entirely absent, as they approach the apex of the root.

A. NINIAN BRUCE.

## PHYSIOLOGY.

**AN INVESTIGATION OF NERVE REGENERATION.** HENRY O. (480) FEISS, *Quart. Journ. Exp. Physiol.*, 1913, vii., p. 31.

THE author concludes that regeneration proceeds centrifugally and from a central source, but the neurilemma sheaths must be in a proper condition both mechanically and nutritionally to receive the newly regenerating fibres. There are two kinds of scars obtainable by interruption of a nerve—the first a mere squeeze, the second a complete division. The first type does not alter the nerve pattern locally; the second does. Degeneration is the same in both. Although regeneration is central in origin, its manifestations are nevertheless often discontinuous, the scars forming regions of obstruction to the outgrowing nerve fibres. As a result, the nerve substance permeating through the compressed scar tissue may be in greater evidence below the scars than in them. In the segments between the scars the axis cylinders are laid down in elongated strands and the myelin in small bits. The sheath cells do not have adherent properties of neuroblasts. Nuclear proliferation may have a protective influence against phagocytosis, but it probably also has an important functional significance indicating that the sheath cells provide the newly regenerating fibres with nutriment. Fibres which have degenerated may show regeneration in the anatomical sense, with good myelination, even if they are prevented from making connection with peripheral end organs.

A. NINIAN BRUCE.

**THE ACTION OF THE CEREBRO-SPINAL FLUID, THE CHOROID (481) PLEXUSES, AND SOME ORGANS AND SUBSTANCES ON THE ISOLATED HEART OF THE RABBIT.** (L'azione del liquido cefalo-rachidiano, dei plessi coroidei e di alcuni organi e sostanze sul cuore isolato di coniglio.) N. DEL PRIORE. *Riv. ital. di Neurop. Psichiat. ed Elettrotet.*, 1913, vi., p. 211.

As the result of his experiments the writer comes to the following conclusions:—

1. The cerebro-spinal fluid of the ox added, in amounts varying from 10-40 c.c. to 1000 c.c. of Ringer-Locke's solution, may exercise an exciting action upon the isolated heart of a rabbit. The

cerebro-spinal fluid of the calf has the same action, perhaps even more marked. Human cerebro-spinal fluid has also a certain exciting action.

2. An extract of the choroid plexuses, in the proportion of 2-3 g. to 1000 of Ringer-Locke's solution, produces an increase in the height, and, though not invariably, in the frequency of the cardiac contractions. An extract of the brain and cerebellum in the same proportions has also an exciting action. Suprarenal extract has a very markedly exciting action, but this action differs according as the organs come from a foetus, a child, or an adult, as the action of the foetal suprarenals is much less evident than that of the suprarenals of a child or an adult.

3. Cholesterin added to Ringer-Locke's solution in the proportion of 0.5-0.10 g. per 1000 does not produce a definite increase in the number of contractions, but a rise in the tracing, which, after one and a half minutes, falls and shows a diminution in the frequency of the pulsations. Protein has the same action. Neurin added in even the most dilute solution develops a depressing action, which is shown by a fall of the cardiogram and a diminution in the contractions.

J. D. ROLLESTON.

**VASO-DILATOR AXON-REFLEXES.** A. NINIAN BRUCE, *Quart.* (482) *Journ. Exp. Physiol.*, 1913, vi., p. 339.

THIS paper has already been abstracted (*v. Review*, 1911, ix., p. 117).

AUTHOR'S ABSTRACT.

**ON THE REACTIONS OF THE SALIVARY CENTRES.** F. R. (483) MILLER, *Quart. Journ. Exp. Physiol.*, 1913, vi., p. 56.

"I. The lingualis reflex.

1. Stimulation of the central end of the lingual nerve (lingualis reflex) causes abundant secretion from the ipsilateral submaxillary gland, and less secretion from the ipsilateral parotid.
2. Slight secretion (about one drop) takes place from the contralateral submaxillary and parotid glands.
3. The threshold of the reflex is very low (sec. coil about 30 cm.).
4. The threshold of the lingualis reflex is lower than that of the peripheral chordo-lingual nerve.
5. The ipsilateral submaxillary latency is less than the parotid latency. The ipsilateral submaxillary latency is less than the contralateral submaxillary latency.

II. The glossopharyngeus reflex.

1. Stimulation of the central end of the glossopharyngeal nerve (glossopharyngeal reflex) causes abundant secretion from the ipsilateral parotid gland, less secretion from the ipsilateral submaxillary.
2. Slight contralateral effects are produced.
3. The ipsilateral parotid latency is less than the submaxillary latency.

III. The gastric vagus reflex.

1. Stimulation of the central end of the gastric vagus (gastric vagus reflex) causes secretion from the submaxillary and parotid glands.
2. The threshold is high.

IV. Stimulation of a sensory nerve (sciatic) causes a slight submaxillary secretion.

V. The salivary reflexes are independent of the associated muscular reflexes.

VI. Afferent fibres for the salivary reflex are contained in the chorda tympani.

VII. The salivary secretion of curare poisoning is caused by asphyxia.

VIII. Two points may be localised by unipolar faradisation of the surface of the medulla oblongata. Stimulation of the one causes parotid secretion; of the other, submaxillary secretion. The stimulus threshold is very low (sec. coil at 80 cm.). The results agree, in the main, with those of previous anatomical work."

A. NINIAN BRUCE.

**THE INFLUENCE OF MUSCULAR RIGIDITY ON THE OXYGEN  
(484) INTAKE OF DECEREBRATE CATS.** H. E. ROAF, *Quart.  
Journ. Exp. Physiol.*, 1913, vi., p. 393.

"DURING decerebrate rigidity the oxygen intake is only slightly greater than when the muscles are flaccid."

A. NINIAN BRUCE.

**THE EFFECT OF THE REMOVAL OF THE HYPOPHYSIS IN THE  
(485) DOG.** JOSHUA EDWIN SWEET and ALFRED REGINALD ALLEN,  
*Annals of Surgery*, 1913, lvii., April, No. 4, p. 485.

THE work upon which this report is based began over a year ago, when the question of the essential characters of the hypophysis was perhaps of more importance from the standpoint of experimental medicine than it is to-day. Hypophysectomy was performed upon twenty-two dogs. The method of approach was through an incision about two inches in length, perpendicularly

over the centre of the zygoma—the zygoma forming, as it were, a base line with the vertical two-inch incision. The zygomatic arch was removed, the coronoid process of the mandible resected, and the base of the skull approached in a direct line. The skull was trephined, and the opening enlarged: after opening the dura, the brain was carefully elevated by a suitable retractor. The hypophysis was removed by a special loop forceps, which enabled the operator to remove the gland in two pieces, the anterior lobe in one piece, and the posterior lobe separately. As regards the post-operative results, seven dogs succumbed within ten days from various causes, ten died during the second and third weeks, five lived for months.

It was found to be exceedingly difficult to ensure a complete physiological extirpation of the gland, as the cells of the pars intermedia extend for a considerable distance forwards towards the chiasma and backwards towards the corpora mammillaria. It is, however, possible to remove the hypophysis physiologically, that is, to remove enough so that certain characteristic changes will follow.

The author considers that there are three well-marked changes which follow hypophysectomy.

The first change concerns the pancreas. It has been noticed to present a striking red coloration similar to that seen normally at the height of digestion—microscopically there are no very marked changes.

The second change, and second also in point of time, has been an atrophy of the genital apparatus, particularly of the testicles. Apparently the atrophy commences very early after the removal of the hypophysis.

The third change noted has been an increase in weight. This did not make its appearance until some time after operation, and in the minds of the authors the question remained undecided as to how far the tendency to obesity was due to a loss of the hypophysis, or to a loss of some other function (testis) controlled by the hypophysis.

JOHN FRASER.

## PATHOLOGY.

**BESTA'S METHOD FOR THE MYELIN SHEATH IN SECONDARY (486) DEGENERATIONS.** (*Il Metodo di Besta per la guiana mielinica nelle degenerazioni secondarie.*) L. LUGIATO, *Riv. ital. di Neurop. Psichiat. ed Elettrotet.*, 1913, vi., p. 193.

THE writer describes Besta's method (*v. Review*, 1912, x., p. 564), and comes to the following conclusions as the result of his experience of the method.

Besta's method clearly shows an alveolo-reticular stroma, with well-defined characters in the myelin sheath. This stroma gradually disintegrates and disappears in secondary degenerative processes of the nerve fibres. Besta's method, like Weigert's, shows the degenerated zones in a negative manner, but at a much earlier period. It may also be of service when the methods of Marchi and Donaggio are not available, because the lesions which they might show are of too old a date. J. D. ROLLESTON.

**ADDITIONAL STUDIES ON THE PRESENCE OF SPIROCHÆTA  
(487) PALLIDA IN GENERAL PARALYSIS AND TABES  
DORSALIS.** H. NOGUCHI, *Journ. Cut. Dis.*, 1913, **xxxi**, Aug., p. 543.

THE technique used is as follows: "From a specimen taken from the gyri frontali, gyri recti, or any other region, and hardened in 10 per cent. formalin, a slice of tissue measuring 5 to 7 mm. in thickness and of variable dimension is taken and put into a mixture containing 10 per cent. formalin, 10 per cent. pyridin, 25 per cent. acetone, 25 per cent. alcohol, and 30 per cent. aqua distillata for a period of 5 days at room temperature. The tissue is then thoroughly washed in distilled water for 24 hours. Next it is transferred to 96 per cent. alcohol for 3 days, and then thoroughly washed in distilled water for 24 hours. After this, the tissue undergoes the following treatment, which is carried out in a dark bottle: (1) Bath in 1.5 per cent. silver nitrate solution for 3 days at 37° C. (or 5 days at room temperature); (2) wash in distilled water for several hours; (3) reduce in 4 per cent. pyrogallie solution with the addition of 5 per cent. formalin for 24 hours at room temperature; (4) wash thoroughly in distilled water; (5) transfer to 80 per cent. alcohol for 24 hours, (6) then to 95 per cent. alcohol for 3 days, (7) absolute alcohol for 2 days, (8) xylol, xylol-paraffin, paraffin. The sections should be cut from various strata of the tissue in order to ensure obtaining the best impregnated zone. The thickness of the section must depend upon the degree of impregnation, which varies considerably according to different specimens of the brain. It is my custom to cut to 3 $\mu$ , but it is often preferable to cut to 5 $\mu$ , as one thereby increases the chances of finding the pallida in a given area. It is highly advisable to impregnate a syphilitic tissue containing numerous pallidæ, in order to control the staining of the brain tissue at the same time.

"When the staining is successful all the various tissues of the brain appear in a colour varying from a pale yellow to a yellowish brown, while the pallidæ are pure black. The neuroglia fibres sometimes stain distinctly, but when examined with artificial



light they are found to be brownish, but never black. It is always my rule in commencing my search for the pallida to start from the palest area and proceed gradually towards the edge, which usually takes on a deeper impregnation.

"The above method is also applicable to cases of tabes dorsalis. It is best to cut the spinal cord 2 cm. long, and to make longitudinal sections."

A. NINIAN BRUCE.

**THE PATHOLOGY OF THE CONDITION KNOWN AS PARASYPHILIS.** JAMES M'INTOSH and PAUL FILDES, *Lancet*, 1913 clxxxv., Sept. 27, p. 921.

THE term "parasymphilis" was introduced by Fournier in 1894 to describe certain changes of an atrophic or degenerative nature which might follow a syphilitic infection.

The authors, in a most interesting paper, consider that syphilis of the central nervous system consists of two main divisions—one largely or entirely confined to the lymph vascular tissues, and the other largely or entirely confined to the brain substance. In each of these two divisions varying numbers of spirochaetae, and, even more so, varying sensitisation of the tissues, will occasion lesions of varying clinical importance. In the vascular tissues these will range from a slight meningitis to a gummatous process, while in the brain from a slight meningo-encephalitis to tertiary encephalitis (dementia paralytica).

A. NINIAN BRUCE.

**CEREBRAL SYMPTOMS IN A BULLDOG ASSOCIATED WITH LYMPHOCYTIC INFILTRATION OF THE VESSELS AND MEMBRANE OF THE BRAIN AND SPINAL CORD.** F. E. BATTEN, *Proc. Roy. Soc. Med.*, 1913, vi., May (Neurol. Sect.), p. 114.

A BULLDOG, aged 16 months, a prize animal, began to suffer from muco-gastro-enteritis with slight weakness in gait. The intestinal symptoms improved but the nervous symptoms grew worse; the eyesight became affected and the gait ataxic. He became very drowsy and listless, and eventually blind. He was killed with chloroform.

The intestine showed marked follicular ulceration. The root of the penis had a curious warty appearance, which was said not to be normal. A perivascular lymphocytosis was found both in the brain and spinal cord similar to that seen in man in syphilitic, trypanosomic, and poliomyelic infection. The interpretation in this case is doubtful, but the possibility of its being venereal is suggested.

A. NINIAN BRUCE.

## CLINICAL NEUROLOGY.

**THE RÔLE OF SCARLET FEVER IN THE ÆTIOLOGY OF (490) NERVOUS DISEASES.** (Die Rolle des Scharlachs in der Ätiologie der Nervenkrankheiten.) R. NEURATH, *Ergeb. d. inner. Med. und Kinderheilk.*, 1912, ix., pp. 103-156.

AN exhaustive monograph, based on fifteen years' study of nervous diseases following acute infections, with a complete review of the literature (*v. Review*, 1912, x., p. 80). The paper contains the histories of eight personal cases illustrative of hydrocephalus, hemiplegia, and multiple sclerosis, following scarlet fever.

J. D. ROLLESTON.

**SOME CLINICAL PHENOMENA OF THE TRANSVERSE LESIONS (491) OF THE SPINAL CORD.** S. V. SEWELL, *Australian Med. Journ.*, 1913, ii., Aug. 23, p. 1178.

THE author discusses the question of disorders of micturition associated with transverse lesions of the spinal cord, and concludes that the bladder mechanism is a reciprocal one, controlled by the lumbar and sacral centres, which are connected together within the cord by association fibres, and which are themselves under voluntary control of the cerebral cortex, whose impulses pass to these centres by way of tracts on either side of the anterior median fissure of the spinal cord.

A. NINIAN BRUCE.

**TRANSMISSION TO MONKEYS OF VIRUS OBTAINED FROM (492) ENGLISH CASES OF POLIOMYELITIS.** JAMES M'INTOSH and HUBERT TURNBULL, *Lancet*, 1913, clxxxiv., Feb. 22, p. 512.

MONKEYS were inoculated intradurally as well as intraperitoneally with emulsions of spinal cord from four cases of poliomyelitis, which, with one exception, occurred in the London Hospital district. Case I. was sporadic, and inoculation into monkeys proved negative. Case II. also proved negative on inoculation into monkeys, due probably to the fact that death resulted from diphtheria, the patient having really recovered from his attack of poliomyelitis. Cases III. and IV. both occurred in a mild epidemic, and could be transmitted to monkeys, whose brain and spinal cord exhibited the characteristic microscopical appearance of acute anterior poliomyelitis. These results are in agreement with those of other workers, who have found that it is extremely difficult to transmit the virus from sporadic cases, whilst in epidemics transmission is successful in the great majority of instances.

The authors suggest that in sporadic cases the virus is feeble,

and the occurrence of the disease is due to a hypersusceptibility of the individual attacked, whilst an epidemic only results when the virus has become exalted either by a series of passages through susceptible individuals or from some other cause unknown.

A. NINIAN BRUCE.

**TABES AND FACIAL PARALYSIS.** (*Tabes et Paralysie faciale.*) (493) L. A. M. JACQUES, *Thèses de Paris*, 1912-13, No. 335.

THE bulbar form of tabes may be accompanied by facial paralysis, which may develop in the pre-ataxic stage, when it is generally benign and of neuritic origin, or appears later when it is of nuclear origin. In some cases it may be neuritic at first and later become nuclear.

J. D. ROLLESTON.

**MACROGLOSSIA CONGENITA NEUROFIBROMATOSA.** (*Makro-glossia congenita neurofibromatosa.*) A. HAYASHI, *Deut. Zeitschr. f. Chir.*, 1912, cxviii., p. 456.

THE patient was a mentally defective boy, aged 3 years, whose right half of the tongue had been noticed to be thicker than the left since the first months of life. For a year it had been increasing in size, and was always protruding from the mouth. Under ether a wedge-shaped piece was removed, and the tongue resumed its normal position. Histological examination showed no new formation nor dilatation of lymph-vessels, and no muscular hypertrophy. Most of the preparation was formed by nerves encased in a hyperplastic perineurium of a myxomatous character. There was no increase in the endoneurium, as in Abbott and Shattock's case.

J. D. ROLLESTON.

**RECOVERY FROM PNEUMOCOCCAL MENINGITIS.** (*Méningites à pneumocoques guéries.*) P. SAVY and J. GATÉ, *Lyon méd.*, 1913, cxxi., p. 55.

A RECORD of two cases: (1) Serous meningitis. The patient was a man, aged 20, in whom the meningeal symptoms were ill-marked. The cerebro-spinal fluid was clear, and showed no micro-organisms on direct examination of a film, but yielded a pure growth of pneumococci on cultivation. Rapid improvement occurred in three days. (2) Suppurative meningitis. A typical case of meningitis with purulent cerebro-spinal fluid containing polymorphs and pneumococci in a man, aged 25. Rapid improvement took place after two lumbar punctures. Orchi-epididymitis, probably of pneumococcal origin, occurred in convalescence. In both cases the meningitis was primary, as neither had any pneumonia, otitis, or rhinopharyngitis.

J. D. ROLLESTON.

**A CASE SIMULATING MENINGITIS IN WHICH THE SYMPTOMS**  
 (496) **WERE CAUSED BY THE ESCAPE OF THREAD-WORMS**  
**INTO THE PERITONEAL CAVITY THROUGH A PER-**  
**FORATED APPENDIX VERMIFORMIS.** R. N. H. ANGLIN  
 WHITELOCKE, *Brit. Journ. Child. Dis.*, 1913, x., p. 296.

A GIRL, aged 5½ years, was admitted to hospital as a case of tuberculous meningitis. An enlarged gland had been removed from her neck a year previously. The symptoms on admission were convergent strabismus, contracted pupils, photophobia, restlessness, and incontinence of urine. The right lower limb was flexed and drawn up on the abdomen, while the left was moved from time to time. Palpation of the abdomen showed marked tenderness over the cæcum, and rigidity over the right rectus muscle. An exploratory incision was performed when the above finding was made. Complete recovery followed removal of the appendix, which was found full of thread-worms.

J. D. ROLLESTON.

**A CASE OF PURULENT MENINGITIS AFTER FRACTURE OF**  
 (497) **THE BASE TREATED WITH HEXAMETHYLENETETRA-**  
**MINE. RECOVERY.** (Et Tilfælde af purulent Meningitis efter  
 Basisfraktur behandlet med Hexamethylenetetramin. Helbre-  
 delse.) CHIEVITZ, *Hospitalstidende*, 1913, lx., p. 929.

A MAN, aged 22, developed signs of meningitis in January 1912, about a week after a fall from a height of 7 metres. The cerebro-spinal fluid was turbid, slightly blood-stained, and contained pneumococci. Hexamethylenetetramine, in doses of about 4 grammes daily, was given. Gradual improvement took place, but deafness in the left ear and vertigo persisted, and were still present when the man had resumed his work in the following September.

J. D. ROLLESTON.

**TWO CASES OF RECOVERY FROM TUBERCULOUS MENINGITIS.**  
 (498) (Fevri geheilte Fälle von meningitis tuberculosa.) V. REICHMANN  
 and F. RAUCH, *Münch. med. Woch.*, 1913, lx., p. 1430.

CASE 1. Child, aged 1½ years, admitted to hospital in June 1912. Condition on admission: Nuchal rigidity, Kernig's sign, cutaneous hyperalgesia, and hydrocephalic cry. Temperature normal. The cerebro-spinal fluid was clear, showed lymphocytosis, excess of albumin, and groups of tubercle bacilli (no animal inoculation seems to have been made.—J. D. R.). Lumbar puncture was performed five times in all, and marked improvement was noted after the second puncture, though the pressure of the fluid remained high for long. The child was last seen in October 1912,

when it had made great progress, though it had not yet learned to speak.

Case 2. Man, aged 21, admitted to hospital in November 1912, with nuchal rigidity and violent headache. The cerebro-spinal fluid was clear, and showed lymphocytosis and tubercle bacilli. Inoculation of guinea pigs was negative, probably on account of the small number of the bacilli, and because their virulence had been weakened by the inoculation not having been made until three days after the lumbar puncture. Recovery was slow, and the patient was not discharged until 23rd January 1913.

The writers have collected from literature eighteen cases of recovery from tuberculous meningitis. J. D. ROLLESTON.

**A CASE OF OTOGENIC CEREBRAL ABSCESS.** JOHN MURPHY and (499) ALEX. LEWERS, *Australian Med. Journ.*, 1913, ii., Aug. 23, p. 1177.

A BOY, aged 16, who had suffered from otorrhoea in his left ear for four years, was admitted to hospital suffering from frontal headache, vomiting, dimness of vision, and transient paralysis of his right arm and leg. The middle ear was found diseased, although the inner ear was intact, and a polypoid mass of granulation tissue was protruding through the upper part of the drum. This was removed, the mastoid antrum opened, the meninges exposed, and the dura opened. No pus was found. The condition of the patient was little altered, so he was accordingly trephined in the temporal region over the left ear, and pus was found on pushing a forceps through the temporo-sphenoidal lobe to the region above the ear. A hernia the size of an orange resulted, but later disappeared, and recovery became complete. A. NINIAN BRUCE.

**AN UNUSUAL CASE OF CEREBRAL ABSCESS.** HAROLD S. RENTON, (500) *Lancet*, 1913, clxxxv., Sept. 27, p. 929.

A MAN, aged 41, was admitted to hospital in a comatose condition. The limbs on the left side were more flaccid than on the right, but the reflexes were normal and equal on both sides. There was no squint or optic neuritis, the pupils were equal, of medium size, and reacted slowly to light. The left side of the face showed supranuclear palsy of the seventh nerve. The condition was at first thought to be due to a right cerebral hæmorrhage, but as he had a hectic temperature and sweated profusely it became evident he was really suffering from a purulent affection of the brain. Shortly before death a greenish discharge "came into the mouth" and required frequent removal.

At the autopsy a large abscess was found in the left temporal

lobe communicating with the lateral ventricle. It was almost empty, and communicated with the middle ear, and the pus had apparently found its way into the mouth by way of the Eustachian tube, as all the pharyngeal tissues were healthy. Over the motor area of the right side of the brain there was extensive purulent meningitis; the right ear was healthy, the base of the brain free from pus, and the left cortex unaffected. A. NINIAN BRUCE.

**A NEUROMA-MYOMA OF THE MESENTERY.** PETER PATERSON, (501) *Lancet*, 1913, clxxxv., Oct. 4, p. 997.

A BOY of 9 years, of poor mental development, was admitted to hospital with pain, tenderness and rigidity in his right iliac fossa, and a leucocytosis of 20,800. The appendix, on removal, was found slightly congested, but otherwise normal. The pain and vomiting, however, continued to recur every seven to ten days, usually developing suddenly and lasting about twenty-four hours. As a smooth oval tumour could be now felt in the middle line, just below the umbilicus, it was removed. On section it was found to be composed of a soft reddish centre, consisting of medullated nerve fibres with a very few ganglion cells. Nearer the periphery plain muscle fibres appeared amongst the nerve bundles, and these gradually increased on passing outwards till, under the capsule, the tissue was almost entirely muscle. A. NINIAN BRUCE.

**CONGENITAL INTERNAL HYDROCEPHALUS: ITS TREATMENT**  
(502) **BY DRAINAGE OF THE CISTERNA MAGNA INTO THE**  
**CRANIAL SINUSES.** IRVING S. HAYNES, *Annals of Surgery*, 1913,  
lvii., April, No. 4, p. 449.

THE author has contributed a most important memoir upon the subject. He writes with the purpose of drawing attention to the advantages of treating congenital internal hydrocephalus by drainage of the cisterna magna into one of the cranial sinuses.

The cisterna magna is one of the cisternæ subarachnoidales, noticeable for its size, and situated at the interval between the under surface of the cerebellum and the posterior surface of the medulla oblongata.

The cistern communicates through the foramen of Majendie with the ventricular system, and alterations in pressure of the cerebro-spinal fluid in the cisterna magna is appreciated within the ventricles.

Cerebro-spinal fluid is a true secretion produced by the gland-like cells of the ependyma, and in congenital hydrocephalus it accumulates within the ventricles. Cushing believes that the

cause of the accumulation is an obscure obstruction to the natural flow of the fluid into the sinuses.

In the understanding of the operation suggested by Haynes there are three important physiological points to be kept in mind :

(1) The pressure in the cerebro-spinal fluid is below that in the arteries, but above that in the sinuses, and therefore the flow of cerebro-spinal fluid will be into the sinuses.

(2) The specific gravity of the fluid (1005-1010) is below that of the blood (1059), and as the current determined by difference in the specific gravity of the two fluids is from that of the lesser to that of the greater, the fluid flows into the blood stream.

(3) Cerebro-spinal fluid is isotonic with blood. And a mixture does not produce coagulation.

Bearing these facts in mind, it is easy to follow the reasoning which suggests a treatment consisting in an establishment of a communication between the cisterna magna and the sinuses.

The steps of the operation may be summarised as follows:— To expose the occipital bone by a mesial posterior incision. To separate laterally the scalp, muscle, and periosteum. To trephine over the mid-point between the foramen magnum and the external occipital protuberance. To remove the bone upwards sufficiently far to expose the termination of the superior longitudinal sinus. To connect with rubber or silver tube the cisterna magna to the torcular, occipital, or superior longitudinal sinuses.

The writer has submitted two cases to an operation of this type. In neither instance could the result be judged satisfactory.

The first case showed an improvement which lasted for about six weeks: at the end of that time there was a relapse, and the child succumbed to progressive hydrocephalus and marasmus.

The second case succumbed three days after operation, apparently from an excessive leakage of cerebro-spinal fluid through the wound.

The value of the article is enhanced by a study of the physiology of the normal intra-cranial circulation: and the formation and deposition of cerebro-spinal fluid. There is a very complete summary of the various methods which at one time or another have been suggested as means of treatment of congenital or acquired hydrocephalus.

JOHN FRASER.

**A CASE HAVING A BEARING ON THE LOCALISATION OF**  
(503) **THE AUDITORY CENTRE.** WM. BOYD and J. STANLEY  
Horwood, *Lancet*, 1913, June 14, p. 1661 [Illustr.].

In this case a large cyst of the left temporal lobe of the cerebrum was present without impairment of hearing. The destruction involved the whole of the temporal lobe, with the exception of the

third and anterior extremities of the second and first convolutions, the last named bearing the anterior gyrus of Heschl on its upper surface.

Campbell has laid stress on the importance from an auditory standpoint of the gyrus of Heschl, and the present case helps to confirm his views.

The cyst was probably of vascular origin.

AUTHORS' ABSTRACT.

**CONSECUTIVE DISPLACEMENT OF THE CEREBRAL HEMI-  
(504) SPHERE ON THE LOCALISATION AND REMOVAL OF  
INTRA-CEREBRAL TUMOURS AND HÆMORRHAGES.  
(APOPLECTIC HÆMORRHAGES AND CLOTS). WILLIAM  
H. HUDSON, *Annals of Surgery*, 1913, lvii., p. 492.**

WHEN operative measures are adopted for the exposure of a brain tumour, or the relief of secondary intra-cerebral pressure, it frequently happens that the brain tension is so great that the tumour cannot be satisfactorily palpated. In such a possibility the presence of the tumour or hæmorrhage may be overlooked. To obviate the error the author recommends the exposure of the dura through a large osteoplastic flap. An omega-shaped temporal flap is raised, and this is reinforced by a second flap which extends posteriorly or anteriorly according to the position of the tumour or hæmorrhage. Such a free removal of bone immediately affords a great relief of tension and a satisfactory palpation is possible. After removal of the tumour or blood clot, the osteoplastic flap is replaced in position and drainage established through a trephinic opening.

Should the tumour be one the removal of which is impossible, or should the cause of the compression not have been found, the bone flap is adjusted in position by special expanding clips which permit considerable displacement.

For the exact operation details, the original article must be consulted, and also a contribution in *Annals of Surgery*, May 1912.

The writer describes a series of instruments which he employs; he claims for some of them a new mechanical principle, and to their use he largely credits the success of the operation.

JOHN FRASER.

**REMARKS ON THE TREATMENT OF BRAIN TUMOUR. CHARLES  
(505) A. BALLANCE, *Lancet*, 1913, clxxv., Sept. 13, p. 792.**

THE author points out that we must remember that the surgeon cannot do more for tumour of the brain than for tumour situated in any other organ. The removal of a single encapsulated tumour



results in cure, with restoration of function in the brain as elsewhere. An infiltrating malignant tumour cannot be eradicated without removing the organ in which it is growing.

Early diagnosis and early operation are the two important points, and should be followed by operation before irreparable damage to the eyesight has occurred. In an infiltrating tumour of the brain, the right course to adopt is decompression, not excision. Decompression relieves the symptoms which depend on increased intracranial pressure, and as a rule it is from this that the acute symptoms result, not from the local effects of the tumour. An osteoplastic flap is a mistake, a large craniectomy is required, and a cerebral protrusion is desirable. The dura must be opened, otherwise the intracranial pressure will not be relieved. Three cases are described in illustration of the above.

Except in cases in which a tumour is supposed to lie in the anterior part of the vermis, or in which exploration of the fourth ventricle is required, it is better not to divide the bone and dura in the middle line, especially in malignant cases, because of the loss of support thereby entailed. It is preferable to make two craniectomy openings, one on each side of the middle line if the diagnosis is in doubt. A complete removal of bone over one cerebellar hemisphere gives an ample window, and if both sides are thus treated the cerebellum can be displaced laterally to a remarkable extent. Cushing's suggestion of cutting through the foramen magnum and of the arch of the atlas is also to be recommended as a means of preventing respiratory failure.

A. NINIAN BRUCE.

**CASE OF SUBCORTICAL CEREBRAL TUMOUR, TUBERCULOUS (506) IN NATURE, REMOVED BY OPERATION; RECOVERY.**

GEORGE HALL and H. BRUNTON ANGUS, *Lancet*, 1913, clxxxiv. March 8, p. 678.

A MINER was admitted to hospital on account of intense frontal headache on the left side, and fits of tingling and jerking of his right leg. These increased, his right arm and right face being involved, and he occasionally lost consciousness. Slight weakness developed on his right side, and sensation became slightly affected. Optic neuritis was present, most marked on the left side. Anti-syphilitic treatment was of no avail, so it was decided to trephine over the left sensori-motor area. The brain bulged markedly, and he developed right hemiplegia with anarthria. Later an encapsulated tumour  $1\frac{1}{2}$  inches long was removed from the wound, and proved to be tuberculous. The hemiplegia and anarthria rapidly disappeared, and apart from a few fits he made a good recovery.

A. NINIAN BRUCE.

**A CASE OF ACROMEGALIA WITH AUTOPSY.** HERMON C. (507) GORDINIER and WILLIAM KIRK, *Albany Med. Annals*, 1913, xxxiv., April, p. 189.

A CASE in a woman, aged 39, with bitemporal hemianopia, drowsiness, slow cerebration, headache, palpitation, asthenia, and the usual skeletal changes. At the autopsy the glandular portion of the pituitary was found completely destroyed by a tumour.

A. NINIAN BRUCE.

**CONTRIBUTION TO THE STUDY OF BITEMPORAL HEMIOPIA.** (508) H. M. TRAQUAIR, *Edin. Med. Journ.*, 1913, xi., Sept., p. 197.

ONLY during recent years has detailed study of the nature of bitemporal hemiopia been commenced. Special perimetric methods are necessary to elicit the true conditions present.

Two types are prominent, one characterised by a scotoma at or near the centre of the field, the other without this feature.

In the former type the scotoma usually begins in the apex of the upper outer quadrant of the field, and spreads downwards to the apex of the lower outer quadrant. About the same time the periphery begins to fail, first along the outer side of the vertical meridian above, forming a notching or depression of the upper outer quadrant, then in the same position below, so that the outer part of the temporal field becomes split off, forming an island which in turn gradually disappears. The lower nasal quadrant then becomes defective, centrally by the encroachment of the scotoma at its apex, and peripherally along its mesial border (vertical meridian), so that finally the upper inner quadrant alone remains. The defect thus proceeds clockwise in the right field, counter-clockwise in the left, the behaviour of the scotoma resembling in its progress that of the field as a whole.

Two cases showing fields of this type are described with charts. One was associated with acromegaly, the other with nasal sinus disease. Tumour pressure is, therefore, unlikely to be the cause of the features referred to, as they occur whether a tumour is present or not. Reference to the literature shows that such scotomata are more common in cases of hypopituitarism in which the tumour is of a relatively actively growing nature than in acromegaly, where the tumour is usually relatively quiescent. Moreover, when the scotomatous type of field does occur in acromegaly the cases tend to be more rapid. The scotomatous type of field, therefore, indicates relative activity of the disturbance, and is probably due to lymphatic or vascular congestion in the chiasmal region, though other factors, such as pressure, are, of course, not excluded, and probably various causes act together with different degrees of importance in different cases.

Other points, such as the recovery of affected parts of the field and the relationship of the colour fields to those for white, are illustrated by the cases described.

Four cases of acromegaly in which relative bitemporal hemiopia without scotoma was present are also described. The condition varied from slight depression of the upper outer quadrants only elicited by a delicate test with Bjerrum's method to hemiachromatopsia found on an ordinary perimeter. The loss of the temporal field from above down was present here also, but the relation of the colour fields to those for white indicated a less active process. In all of several other cases showing indications of acromegaly slight field changes were found. It is, therefore, likely that the proportion of cases of acromegaly in which field changes are present is very much greater than is indicated by present statistics, and that the frequency of scotomata in cases of chiasmal interference is also underestimated at present. Greater exactitude and a standard method in examining and recording are required to enable proper comparison of results. **AUTHOR'S ABSTRACT.**

**DID NAPOLEON BONAPARTE SUFFER FROM HYPOPITUITARISM (509) (DYSTROPHIA ADIPOSEO-GENITALIS) AT THE CLOSE OF HIS LIFE?** LEONARD GUTHRIE, *Lancet*, 1913, clxxxv., Sept. 13, p. 823.

THE author shows that there is considerable evidence that Napoleon, towards the close of his life, suffered from hypopituitarism of the anterior lobe in the shape of genital atrophy, sexual alopecia, skeletal and tissue changes of feminine type, and lowered temperature. Hypopituitarism of the posterior lobe was, perhaps, indicated by obesity and lowered metabolism. In regard to evidence of hyperpituitarism in Napoleon up to the zenith of his career one is on less sure ground. One can only adduce the habitual slowness of pulse, the life-long frequency of micturition, "the libido-sexualis," and the anomalous cerebral attacks to which he was liable, as evidence of some form of dyspituitarism.

The lesion is hardly likely to have been a tumour, as his vision appears to have been in no way affected, and thus was probably functional; but as the head was not opened after death, the condition of the hypophysis cerebri must remain for ever unknown.

**A. NINIAN BRUCE.**

**ON LOCALISED ATROPHY IN THE LATERAL GENICULATE (510) BODY CAUSING QUADRANTIC HEMIANOPSIA OF BOTH THE RIGHT LOWER FIELDS OF VISION.** C. WINKLER, *Folia Neuro-biologica*, 1913, vii., August, p. 1.

As a result of the study of the brain of a woman, aged 37, unmarried, who suffered during life from transitory sensory

aphasia, alexia, and permanent quadrantic hemianopsia in the lower right fields of vision, an incomplete atrophy of the cauda of the lateral geniculate body was found. The author concludes that vision in the upper quadrants of the field of vision is possible, notwithstanding the total loss of all the cells and fibres in the medial (caput) division of the crossed lateral geniculate body, as long as the cells and fibres of the cauda (origin of the ventral geniculo-cortical radiation) are intact. It is not sufficient that the ventral occipital convolutions are destroyed to make all the cells disappear out of the lateral (cauda) division of the geniculate body. This only occurs when more proximally situated parts of the gyrus occipito-temporalis are destroyed. The cortical areas belonging to the lateral geniculate body are not only limited to the cortex of the occipital lobe.

A. NINIAN BRUCE.

**DEATH FROM "606."** (La mort par le 606.) H. MISKDJIAN, *Thèses de* (511) *Paris*, 1912-13, No. 418

THE author has collected 167 cases from literature in which death followed the injection of "606," or neosalvarsan. The cases are classified as follows: Primary syphilis, 10 cases; secondary syphilis—(a) active, 32 cases; (b) latent, 3 cases; secundo-tertiary syphilis—(a) active, 3 cases; (b) latent, 5 cases; tertiary syphilis—(a) active, 36 cases; (b) latent, 4 cases; parasyphilis—tabes, 16 cases; general paralysis, 15 cases; leucoplasia, 1 case; syphilis of uncertain period, 19 cases; inherited syphilis, 5 cases; hæmorrhage or thrombosis of cerebral arteries, 4 cases; non-syphilitic disease, *e.g.*, typhus, Hodgkin's disease, malaria, recurrent fever, cancer, and plague, 14 cases.

In 51 death was independent of "606," being due to the progress of the disease, whether syphilis or not, an intercurrent disorder, or to the injection having been given *in extremis*. 19 were suffering from severe organic disease, such as uræmia, tuberculosis, heart disease, or aneurysm. In 61, who were mostly young and healthy persons, death was due to arsenical intoxication either of the gastro-intestinal form (22 cases) or of the cerebro-spinal form (39 cases).

In 3 death was due to myelitis, in 5 to icterus gravis, and in the remainder to faulty technique, except in 10, where no definite cause could be ascertained.

The 29 cases in which an autopsy was obtained are divided into two groups—(1) 22 cases of hæmorrhagic encephalitis, with or without renal, hepatic, or other lesions; (2) 7 cases in which cerebral lesions were absent or unimportant, but various other lesions were found, *e.g.*, intense parenchymatous degeneration of

the kidneys with hyperæmia, congestion of the other organs, such as the suprarenals, thyroid, etc., and acute pulmonary œdema.

J. D. ROLLESTON.

**THE TREATMENT OF SYPHILITIC AFFECTIONS OF THE CENTRAL NERVOUS SYSTEM, WITH ESPECIAL REFERENCE TO THE USE OF INTRASPINOUS INJECTIONS.** HOMER F. SWIFT and ARTHUR W. M. ELLIS, *Journ. Int. Med.*, 1913, xii., Sept., p. 331.

THE introduction of salvarsan directly into the cerebro-spinal fluid in syphilis of the central nervous system suggests itself as a means of intensifying the treatment, but subsequent examination of the cerebro-spinal fluid after high injections of the drug in monkey-serum intraspinously in monkeys showed that the drug introduced in this form was too irritating to warrant its application to patients. Neosalvarsan injected intraspinously into monkeys was less irritating, but when injected into patients produced symptoms too severe to warrant its continued use (*v. infra*). Serum, on the other hand, can be repeatedly injected into the subarachnoid space without demonstrable injury to the nervous tissue. Serum of salvarsan-treated patients has a definite anti-spirochetal effect, both *in vitro* and *in vivo*. The technique of such subarachnoid injections is here described, and its combination with intensive intravenous treatment is indicated where specially intensive treatment is required, as in rapidly advancing tabes or paresis.

The treatment here adopted was to give 0.45 gm. to 0.5 gm. every two weeks, and in addition intraspinous injections of 30 c.c. of 40 per cent. serum until the cerebro-spinal fluid showed a normal cell count and a negative Wassermann reaction.

A. NINIAN BRUCE.

**THE TREATMENT OF SYPHILITIC DISEASES OF THE NERVOUS SYSTEM BY SUB-ARACHNOID INJECTIONS OF NEOSALVARSAN.** (Behandlung syphilitischer Erkrankungen des Nervensystems mittels intra-arachnoidealer Injektion von Neosalvarsan. G. MARINESCO, *Ztschr. f. Physik. u. diätet. Therap.* 1913, xvii., p. 194.

RECORDS are given of thirteen cases who were each given from 4 to 5 c.c. of a solution of neosalvarsan intraspinously. Except for three cases, all the others bore the injection very badly, some becoming very much worse, eight developing retention of urine, and requiring catheterisation. One case, suffering from amblyopia, became blind.

A. NINIAN BRUCE.

**GUMMA CEREBRI: RESULTS OF TREATMENT: SOME HISTO-**  
(514) **LOGICAL FEATURES.** HOWARD H. TOOTH, *Proc. Roy. Soc. Med.*, 1913, vi., May (Neurol. Sect.), p. 87.

DURING the ten years 1902-11 there were under treatment in the National Hospital, Queen Square, 71 cases of cerebral disease due to syphilis. (Vascular lesions and cases exhibiting symptoms of general paralysis have not been included.) Of these 31 gave definite localising signs of intracranial growth, and 15 came to operation; 16 were treated more or less successfully by anti-syphilitic methods. In addition 9 were diagnosed as gumma cerebri, and improved much on treatment. Forty cases are thus here considered.

Many cases of gumma, or so-called pachymeningitis, arrive at a stage in which treatment by ordinary medical methods is of no avail. The growth must be treated as a tumour. Of 15 such cases operated upon, 4 died (26·6 per cent.). In 12 the operation was performed on the central region. Four of the remaining cases were traced and were all alive several years afterwards.

Sixteen cases were treated medically only. They all presented localising signs—4 frontal, 6 central, 1 temporo-sphenoidal, 3 cerebellum, 1 crus cerebri, 1 multiple gummata, 4 foci found post mortem. Five died (31·2 per cent.), 9 may be said to have been successfully treated (56·2 per cent.), and 2 derived no benefit.

Of 9 cases without localising signs, 5 (55·5 per cent.) apparently completely recovered, 2 almost completely recovered, and 2 improved but little.

The medicinal treatment almost universally employed was mercurial inunction and pot. iod. 10 gr. to 20 gr.

Of 31 cases of "cerebral syphilis," 13 were decidedly improved, 8 left hospital in much the same condition as on admission, and 3 have died. Of these 31 cases, 22 were males and 9 females. Among the symptoms were: headache and vomiting in 9; mental symptoms in 16, mostly dullness and slow cerebration; convulsions in 9; cranial nerve lesions in 12, nearly all of third and sixth nerves; optic neuritis in only 1; optic atrophy in 4; some degree of paralysis in 9.

The excised masses were examined in 11 cases. The foci usually develop in the pia-arachnoid. Masses of leucocytes are thrown out widely, but mostly aggregated around the vessels and tending to spread down into the cortex and white matter. Plasma cells and fibroblasts then appear, and no doubt form the basis of the fine supporting structure, and later of the scar-like tissue, of the gumma. The changes in the vessels occur in the intima, the intimal coat becoming invaded, usually at one side, and thickened at the expense of the lumen, which may become obliterated. The

reticular network then develops into thick fibres and the mass becomes sclerosed. The underlying cortex may only suffer to a very slight extent, or patches of inflammation or necrosis may be found. An active proliferation of the pia may occur strongly suggestive of some irritative cause, perhaps of an infective nature, and strongly resembling a glioma. A. NINIAN BRUCE.

**HEMIPLEGIA FOLLOWING SYPHILIS, WITH SPECIAL REFERENCE TO A CASE OF DOUBLE HEMIPLEGIA AND PSEUDO-BULBAR PARALYSIS.** MURDOCH MACKINNON, *Lancet*, 1913, clxxxv., Oct. 4, p. 989.

A CHINESE sailor, aged 39, was admitted to Greenwich Hospital for Seamen on 3rd May 1910, with a healing chancre and a roseolar rash. He was given benzoate of mercury, 4 gr. daily, and pot. iod. 10 gr. t.i.d. He left hospital on 10th August apparently quite well.

On 30th September he was readmitted with a history of having lost the power of his right arm and leg four days previously. He was given mercury and pot. iod., and was discharged much improved on 19th December. On 2nd January 1911 he was again admitted to hospital with complete left hemiplegia and inability to talk. The tongue, soft palate, and lips were completely paralysed, and there was great difficulty in swallowing and in breathing. He was given mercury and pot. iod., and later 0.6 grm. salvarsan. He was discharged on 16th June, when he could walk and talk perfectly well, and showed very little evidence of the successive attacks of paralysis.

Three other cases are also mentioned, the first in a man aged 30, which occurred nine months after infection, the second in a man aged 40, five years later, and the third in a man aged 30, nine months later (*cf. Review*, 1913, xi., p. 257).

A. NINIAN BRUCE.

**THE LUETIN TEST.** FERDINAND SCHMITTER, *Journ. Cut. Dis.*, 1913, (516) xxxi., Aug., p. 549.

THE author examined 150 cases with luetin prepared by Noguchi. He considers that the luetin test, like the Wassermann reaction, is a valuable diagnostic aid when interpreted properly, especially in conjunction with the clinical findings (*v. Review*, 1913, xi., p. 190).

A. NINIAN BRUCE.

**A REPORT ON THE ANALYSIS OF THE CEREBRO-SPINAL**  
(517) **FLUID.** W. F. SCHALLER, *Journ. Nerv. and Ment. Dis.*, 1913, xl.,  
August, p. 489.

THE material for this paper is taken from the records of 109 cases of nervous affections. The cell count, globulin reaction, and Wasserman reaction are especially considered. There is nothing new in the paper.  
D. K. HENDERSON.

**SOME ANATOMICAL CONSIDERATIONS OF THE DISPOSITION**  
(518) **OF THE SCIATIC NERVE AND FEMORAL ARTERY:** with  
suggestions as to their clinical significance. F. WOOD-JONES,  
*Lancet*, 1913, clxxxiv., March 15, p. 752.

THE pressure of the lowest cord of the brachial plexus upon the rib produces the sensory changes, the muscular wasting, and the vascular symptoms in cases of "cervical ribs." In the arm both vascular and nervous symptoms are produced by one pressure point, and may be manifested together, although either symptom may be predominant (*v. Review*, 1913, xi., p. 486).

These two symptoms are manifested separately in the leg and under different circumstances, thrombo-angeitis of the leg with intermittent claudication being accompanied by only trivial nervous symptoms, and neuritic sciatica by no vascular changes. These are explained by the fact that in the arm the limb artery accompanies the main limb plexus, while in the leg they are situated on opposite sides of the limb.

In the amphibia and reptilia the artery of the hind limb runs along with the sciatic nerve on the caudal aspect of the limb. In mammals the arteries lie on the flexor aspect of the limb so as to avoid stretching in active limb movements, while the sciatic nerve retains its primitive position on the extensor aspect. If the leg be strained back the artery becomes stretched, if strained forward the nerve is stretched. This latter condition will occur in those who have to remain long in a sitting posture, and will produce pressure or tension sciatica, while the former condition will be found in those who have prolonged hours of standing, and will lead to thrombo-angeitis with intermittent claudication.

A. NINIAN BRUCE.

**A NOTE ON REMISSION IN A CASE OF EPILEPSY.** D. W.  
(519) CARMALT JONES, *Lancet*, 1913, clxxxiv., Feb. 8, p. 384.

A GIRL, aged 4 years, who suffered from epileptic fits developed pneumonia and was ill eight weeks. During this time the fits were in abeyance. There was some recurrence when the pneumonia was over, but after convalescence was established the fits com-



pletely ceased. The case is of interest as being suggestive of the infective nature of some kinds of epilepsy, and as being a possible instance of an obscure process of immunity.

A. NINIAN BRUCE.

**PIBLOKTO OR HYSTERIA AMONG PEARY'S ESKIMOS.** A. A. (520) BRILL, *Journ. Nerv. and Ment. Dis.*, 1913, xl., August, p. 514.

PEARY, in his book on "The North Pole," gives some interesting particulars in regard to a disease which the Eskimos call piblokto, and which he designates as hysteria. No child has ever been known to have piblokto, but someone among the adult Eskimos would have an attack every day or two. "It seems to be the result of brooding over absent or dead relatives, or a fear of the future."

An attack has been described as follows:—"A woman will be heard softly singing and accompanying herself by striking the fist of one hand with the palm of the second, making three sounds, one long followed by two short ones. The rhythm and motion continues to increase for some time, during which she tears off her clothing, and ends in a fit of crying or screaming, in which the woman may imitate the cry of some familiar animal or bird. Some women drop down on their hands and knees and crawl around barking like a dog. One woman used to lie on her back on the snow and place ice on her breasts; another may jump into the water and wade among the ice-cakes, all the time singing and yelling." The attacks last from one to one and a half hours, usually end in sobbing or falling asleep, from which they awaken in a perfectly normal state. The attacks are usually accompanied by a certain loss of consciousness, but no typical *grand mal* seizure has been seen. Brill considers that piblokto is essentially the same as hysteria, owing to its predominance in the female sex, and owing to its psychogenetic origin.

D. K. HENDERSON.

**LATE SUPPURATIVE POST-TYPHOID THYROIDITIS AND (521) SECONDARY GRAVES' DISEASE.** (*Strumitis posttyphosa apostematosa tarda, und sekundäre Basedowsche Krankheit.*) G. GALL, *Deut. med. Woch.*, 1913, xxxix., p. 1302.

MAN, aged 39. At the age of 16 he had been operated on for goitre. For the next two years he had been in good health, and noticed no swelling in his neck. In the third year he had an attack of typhoid fever, in convalescence from which his neck began to swell again, but the swelling soon subsided. The present illness had started one month previously. Signs of an abscess in the thyroid were accompanied by rapid loss of weight, sweating,

tremor, tachycardia, exophthalmos, and von Graefe's symptom. Five months after evacuation of the abscess, which contained typhoid bacilli, all the symptoms had disappeared.

The occurrence of Graves' disease in infective thyroiditis is well known, but in most cases the inflammation is non-suppurative.

J. D. ROLLESTON.

**TRIGEMINAL DURAL NEURALGIA.** BEVERLEY R. TUCKER, *Journ. (522) Nerv. and Ment. Dis.*, 1913, xl., August, p. 521.

DURING the last five years the writer has observed a type of head pain, neuralgic in character, yielding but slightly to the usual analgesics, having more or less distinct manifestations, and due to neuralgia in the dural branches of the fifth nerve, just as tic douloureux, with which it is at times associated, is due to neuralgia in its peripheral branches. For this condition the name trigeminal dural neuralgia has been selected.

Nine cases are described in a short tabulated form.

D. K. HENDERSON.

**HYOSCINE-MORPHIA ANÆSTHESIA FOR ALCOHOL INJECTION (523) IN NEURALGIA.** WILFRED HARRIS, *Lancet*, 1913, clxxxiv., March 29, p. 881.

THE injection of the trigeminal nerve for tic douloureux with alcohol causes considerable pain. Nitrous oxide or gas and oxygen are not suitable anæsthetics on account of the muscular spasm they produce. Under chloroform it is a difficult and slow process, and it is necessary to allow the patient gradually to come round to know if the nerve has been properly injected, as the only satisfactory proof is anæsthesia of the skin and mucous membrane in the distribution of the nerve. Eucaine solution does not diminish the pain much.

The author now recommends that  $\frac{1}{3}$  gr. of morphia with  $\frac{1}{160}$  gr. of hyoscine be given hypodermically into the arm twenty minutes before the time for the alcohol injection. The patient must now lie down. When the needle is approaching the foramen ovale the patient usually shows signs of sensitiveness, and a few drops of 3½ per cent. eucaine solution may now be injected. The alcohol may now be slowly injected in the usual manner. The addition of  $\frac{1}{15}$  gr. of atropine to the preliminary injection will diminish any tendency to vomiting.

A. NINIAN BRUCE.

**SOME PELVIC DISORDERS IN RELATION TO NEURASTHENIA.**

(524) CARLTON OLDFIELD, *Practitioner*, 1913, xci., Sept., p. 335.

A BRIEF discussion of this subject, concluding with the opinion that pelvic disorders have no specific action in causing neurasthenia. Pelvic complaints, with the exception of disorders of menstruation, are as often as not unassociated with physical signs, and due to a general neurasthenia. Great care, however, is necessary before, during, and especially after operation, in order to prevent post-operative neurasthenia.

A. NINIAN BRUCE.

**SHOULD A MAN WITH MINERS' NYSTAGMUS WORK?** STANLEY

(525) RISELEY, *Lancet*, 1913, clxxxiv., March 1, p. 598.

WHEN a man claims to be, and is admitted to be, incapacitated by nystagmus, after a reasonable period, during which he has been under constant observation, if his condition warrants his being employed, he should eventually resume work under ground, but as a commencement occupation above ground should be provided. There is no doubt that a man with bad nystagmus can work and do good work, and is no worse for doing it. The attitude that a man with nystagmus should not be allowed to work, and advised never to return to the pit, is not justified.

A. NINIAN BRUCE.

**THE EPIDEMIOLOGY OF PELLAGRA.** J. F. SILER and P. E.

(526) GARRISON, *Amer. Journ. Med. Sc.*, 1913, July, cxlvi.

THIS is the first part of an article which will be concluded in the next number.

The territory selected was Spartanburg county in South Carolina. The total population of the county is 83,465, and it contains 762 square miles.

From 1st June to October 1912, 282 cases of pellagra were studied in detail. Definite knowledge was also obtained in regard to 94 additional cases, giving a ratio of 44.9 per 10,000 of population. The population may be divided into (1) rural, (2) mill-village, (3) urban.

The cases of pellagra were found to be excessively prevalent in the mill-villages where the population was congested.

In Spartanburg county the white race predominates numerically over the black in the proportion of two to one, but there were ten white pellagrins to one negro pellagrin. In considering this racial comparison, it is interesting to note the practical absence of negroes from the mill population.

In regard to sex distribution, pellagra appeared nearly three times more frequently among females than among males.

The age distribution showed that 56·4 per 10,000 occurred in individuals twenty years and older, 15·5 per 10,000 in individuals nineteen years and younger.

The distribution of cases in families is also considered.

D. K. HENDERSON.

## PSYCHIATRY.

**AN ADDRESS ON MIND AND MOTIVE: SOME NOTES ON**  
(527) **CRIMINAL LUNACY.** DAVID NICOLSON, *Lancet*, 1913, clxxxv.,  
Sept. 13, p. 787.

THE idea of crime on the one hand, and the idea of insanity on the other, each in its way implies a deviation more or less important from standards of conduct which bear the stamp of social sanction. Insanity is a mental condition or a neurosis, and its heredity or hereditary transmission is a fact in nature well established and universally accepted. Now, crime is neither a mental condition nor a neurosis, and is to be regarded in the main as an occupation resulting from environment, and entered upon as a means of trying to make a living. A peculiar interest thus attaches to the question of insanity when raised in connection with a criminal offence, especially if the offence be murder and the penalty death. The broad guiding principles upon which medical opinion has to be based are two in number:—(1) That no lunatic shall be hanged, and (2) that no mere criminal shall, on the plea of insanity, be allowed to escape the due punishment for his act of murder. In the procedure by which a decision is arrived at as to whether a prisoner is or is not a criminal lunatic, there are three stages where the state of his mind may come up for consideration: (1) The jury may be called upon to give their verdict as to his fitness to plead; (2) the trial itself; (3) the prerogative of mercy exercised by the Home Secretary. A good rough-and-ready test for use in a court of law, and the question is one which a medical witness ought to be prepared to answer, is—(1) If he can say the prisoner did not know right from wrong; (2) if the prisoner did know right from wrong, but that his self-control was in abeyance or lost; (3) if the prisoner knew right from wrong absolutely. At the trial of James Jefferson, at Leeds, in 1908, the jury found him guilty although insane, as he knew he was doing wrong, and he was sentenced to death; but the higher court set the verdict aside and sent him to an asylum, showing that in the eye of the law a knowledge of right and wrong is not incompatible with the existence of insanity, carrying with it irresponsibility, in the individual.

Mental enfeeblement in some form is a precursor of the insanity which leads up to murder in many cases, and must be reckoned with, but it must be remembered that mental enfeeblement itself neither constitutes insanity in any form or implies irresponsibility.

Questions of infidelity, alcoholic excess, delirium tremens, drunkenness, epilepsy, and delusions, either in mania or melancholia, in their relation to criminal lunacy, are then discussed, typical cases of each being given. The author states also that in all his experience he has never been able to satisfy himself in any case of drink or epilepsy, where murder has been committed, that the whole of the circumstances of the act have been completely obliterated from the memory. Confusion and incompleteness of memory regarding some part may occur, or single and simple automatic acts may be completely forgotten, but that is quite a different matter.

Malingering, imposture, and feigned insanity usually expose themselves, as the prisoner overacts the part.

A. NINIAN BRUCE.

**THE THERAPEUTIC VALUE OF SODIUM NUCLEINATE IN**  
(528) **GENERAL PARALYSIS AND DEMENTIA PRÆCOX.** (*Sul valore terapeutico del nucleinato di sodio nella paralisi progressiva e nella demenza precoce.*) ANTONIO MORETTI, *Rassegna di Studi Psichiat.*, 1913, iii., p. 269.

AFTER briefly referring to the negative results obtained by this method of treatment in cases of general paralysis in Florence, the author describes three cases of dementia præcox in which all the symptoms upon which this diagnosis had been based completely disappeared after a series of injections of sodium nucleinate. He accordingly considers that this line of treatment is justifiable, especially in early cases, where the diseased process may not have yet produced any irreparable damage, as we know very little of the etiology and pathology of this condition.

A. NINIAN BRUCE.

**CONTRIBUTION TO THE STUDY OF THE MANIC-DEPRESSIVE**  
(529) **PSYCHOSIS.** (*Contributo allo studio della psichosi maniaco-depressiva.*) G. MARTINI, *Riv. ital. di Neurop. Psichiat. ed Elettrotet.*, 1913, vi., p. 297.

A CASE remarkable for the late development of the psychosis. The patient was a woman, aged 58, in whom the menopause had occurred two years previously. The exciting cause was a fright caused by an explosion. Recovery took place in about eighteen months.

J. D. ROLLESTON.

**A CASE OF MANIC-DEPRESSIVE PSYCHOSIS IN AN ACHONDROPLASIA.** (Su di un caso di psichosi maniaco-depressiva in acondroplasico.) G. ZUCCARI, *Riv. ital. di Neurop. Psichiat. ed Elettrotet.*, 1913, vi., p. 289.

MALE, aged 46, who had two maniacal attacks in the course of three years. Though mental disturbances are not uncommon in achondroplasia, this is only the third case on record of maniacal attacks occurring in this condition. J. D. ROLLESTON.

**FUNCTIONAL PSYCHOSES OF THE SENILE PERIOD.** ALBERT C. (531) BUCKLEY, *Pennsylvania Med. Journ.*, 1913, Feb.

FROM the experience of about one hundred patients whose psychoses were observed the following conclusions may be drawn: (1) True atrophic senile dementia is comparatively infrequent among the mental disorders of senility; (2) senility is a relative term, and the determination of its existence should be based upon anatomico-pathological criteria rather than on any age limit; (3) psychoses occur during the period of senility which are not, in the strict sense of the expression, "senile psychoses"; (4) the majority of mental disorders of old age are the result of arteriosclerosis of the cerebral vessels and its effects; (5) functional psychoses, such as occur in early life, are not infrequent among senile individuals; (6) the functional psychoses which are seen in old age are likely to be of (a) the confusional type, (b) the depressive (melancholic) type, or (c) the recurrent manic or melancholic (manic-depressive) type; (7) the confusional and depressive types appear to be of toxic origin, probably due to systemic vascular disease affecting the kidneys, liver, or intestines; (8) of the functional psychoses 20 per cent. are recoverable.

A. NINIAN BRUCE.

**THE INCIDENCE OF INHERITED SYPHILIS IN CONGENITAL MENTAL DEFICIENCY.** (532) J. LESLIE GORDON, *Lancet*, 1913, clxxxv., Sept. 20, p. 861.

THE author applied the Wassermann reaction to the blood serum of 400 patients in the asylums of the Metropolitan Asylums Board who were suffering from various forms of congenital mental deficiency, and found that 66 (or 16.5 per cent.) gave a positive result. Stigmata of syphilis could only be distinguished in 11 of these 66 cases, and in some were doubtful. An analysis of the various types is given, and the conclusions are drawn that (1) a syphilitic infection is associated with a considerable number of cases of congenital mental defect, mostly the result of inherited syphilis;

(2) inherited syphilis, either alone or in conjunction with other factors, plays an important part in the causation of congenital mental defect; (3) in very many cases syphilis can only be detected by means of the Wassermann reaction; (4) excepting hydrocephalus, and certainly of the plegic forms, inherited syphilis is as likely to cause a simple, uncomplicated form of congenital mental defect as it is to cause any particular type; (5) the Mongolian and epileptic types are not commonly caused by inherited syphilis.

A. NINIAN BRUCE.

**THE RECORDS OF FOUR UNUSUAL RECOVERIES IN CASES (533) OF MENTAL DISEASE.** LEWIS C. BRUCE, *Lancet*, 1913, clxxxiv., April 12, p. 1022.

*Case I.* Male, aged 30, confirmed epileptic, and exhibiting mild type of imbecility: seizures averaged at one time 200 to 300 per month. 40 c.c.s. of blood were drawn weekly for a period of six weeks from his median basilic artery, i.e., 240 c.c.s. in all, for testing, but from the day of the first bleeding till now (a period of eight years) he has had no further epileptic seizures.

*Case II.* Woman, aged 57, suffering from recurrent attacks of *folie circulaire* mania, with barely recognisable periods of depression. Each of the attacks of excitement lasted about six weeks, and was accompanied by a recurring leucocytosis of from 12,000 to 20,000, and by a specific agglutinin in her serum to a variety of streptococcus isolated from the blood of a case of acute mania. Injections of this streptococcus failed to produce immunity, but feeding her with living cultures of this organism grown in sterilised broth for forty-eight hours at 37° C., 1 oz. thrice daily between meals, resulted in recovery.

*Case III.* Woman, 32, melancholic, with fixed delusions; nutrition miserable. Four years after onset of illness she developed scarlet fever of a mild type, with little constitutional disturbance (highest temperature being 101° F.). As she convalesced from the fever a marked physical and mental improvement was noticed, and she ended by making a complete recovery.

*Case IV.* Woman, aged 27, morose, impulsive, absolutely intractable, with delusions of identity, and apt to suddenly attack fellow patients. Suddenly one morning she was found in bed unconscious with symptoms of right hemiplegia and aphasia. This was followed by three weeks of hyperpyrexia (temp. 104° F.) after which the paralysis passed off and speech returned. She finally made an excellent recovery, leaving the asylum to go into service.

A. NINIAN BRUCE.

## TREATMENT.

**STRYCHNINE IN HEART FAILURE.** JOHN PARKINSON and R. A. (534) ROWLANDS, *Quart. Journ. Med.*, 1913, vii., October, p. 42.

THE authors find no evidence that the subcutaneous injection of a full dose of strychnine in cases of heart failure with a regular rhythm produces any change in the blood pressure, rate of pulse, rate of respiration, or general symptoms within the hour following its administration. They conclude that strychnine has no effect which justifies its employment as a rapid cardiac stimulant in cases of heart failure.

A. NINIAN BRUCE.

## Reviews.

**TRAITÉ INTERNATIONAL DE PSYCHOLOGIE PATHOLOGIQUE.**

(535) Directeur: Dr A. MARIE (de Villejuif). Tome troisième Psychopathologie Appliquée, avec 338 gravures dans le texte. Paris, Librairie Félix Alcan, 1912. Pp. 1076.

WITH the issue of this volume Dr Marie's monumental work is completed. The previous numbers, which dealt with the subjects of "General Psychopathology" and "Clinical Psychopathology" respectively, have been reviewed in these pages. It may be stated at the outset of this review that the present volume of "Applied Psychopathology" maintains the high standard of the treatise. The several subjects are written by alienists of indisputable authority, and there is a consistency of merit rarely attained in the united labour of many authors.

Opening with a general survey of the physiopathology of that part of the brain devoted to sensation and feeling, Bianchi has little that is new to relate; he has, however, invested the subject with interest, and realises fully the necessity for a thorough understanding of it as the basis of all mental knowledge:—"Nihil est in intellectu quod non prius fuerit in sensu." He traces the evolution (individual and racial) of sensations, and their development into perceptions and feelings, that is to say, into successive notions and successive modifications of the Ego. The whole of our present knowledge of sensation and its application in mental disease is clearly and comprehensively stated.

An admirable introduction is thus given to one of the most important monographs in the volume, that of the late Prof. Sikorsky, "On mental disease from a psychological standpoint." This monograph is divided into two parts, one having reference



to the manifestations of mental disease, the other to the psychology of mental states. Sikorsky, in his study of the manifestations of mental disease, confines himself to the transient features such as mimicry, the acts and the attitudes seen in the several mental conditions, normal and abnormal. The author draws largely from the work of Duchenne, Boulogne, Charcot, Darwin, and others, pioneers in this particular field, and the results of his own researches are summarised and discussed. Of special interest in this illuminating study are those parts on the variations of mimicry according to race, age, sex, etc. In the second part of the monograph Sikorsky is met with the difficulties which surround the subject of psychology. This subject is one of the weakest in our medical armoury, and recent psychological researches require to be amplified before much can be said in its favour. The future of physiological and experimental psychology, and especially the progress of neurology, have rendered indispensable the extension in every direction of clinical investigation of both mental and bodily states considered in their mutual relations. Such efforts must be singularly arduous, and the guidance which is given to the manner in which these studies ought to be conducted is of marked value. Practical papers on pathological emotional conditions, and sexual psycho-pathogenesis, are contributed by Dumas and Hellis.

The chapter on sexual mental affections is in the able hands of Havelock Ellis, who groups all cases formerly described under the headings of moral insanity, amorality, and moral idiocy, and takes as the criterion of his study the abnormal reactions from morality which are associated with a basis of organic defect, congenital or acquired, and generally linked to a certain degree of mental defect.

A large part of the volume is devoted to comparative psychopathology. The introduction of this subject by A. Cullerre is a painstaking and conscientious record, in which much that is curious and of absorbing general interest is introduced. The psychopathology of the several races forms the major portion of the part; it is written by the Editor, and is well worthy of close perusal. Originating as a scientific study in the school of Herbart, our knowledge of comparative psychopathology has made great progress, and the greater progress it makes, the clearer does it become that mental affections, whether in history, in races, in the human being, or in the lower animals, are governed everywhere and at all times by the same laws of general unity. The sick man is the neighbour of him who is normal, and physiology and pathology only differ in degree and by insensible transitions. The influence of climate and custom in modifying disease may here be

noticed. Syphilis, for instance, is very prevalent in Asia and Africa, but it rarely acts on the nervous system; this is thought to be due to the elimination of toxins by the sweat, and by a simple life in the open air. A similar explanation applies to the relative infrequency of nervous lesions in consequence of intemperance in the use of hashish and alcohol. Again, among the Russians the lavish use of tea, of melon water, and of fruits, by lavaging the intestinal tract, mitigates the effects of poisonous substances. Bearing in mind the advocacy of castration, and the removal of the ovaries in the treatment of sexual excess and sexual perversion, the reference in this chapter to the prevalence of erotic insanity among eunuchs must not be overlooked.

The wide range of study pursued by the Editor is further emphasised by his collaboration with N. Bagenoff in what is designated "The collective insanities," conditions better known in this country as "Communicated insanities." The history of epidemic insanity in particular, with the deductions drawn from the symptoms displayed during the epidemics, reveal the authors at their best. Discussion of these subjects are usually entered into in a biased spirit, and it is to their credit that they have so well maintained an unprejudiced attitude, and kept in view the dictum of Renan in his "Vie de Jésus":—"Medicine has names to express great departures from ordinary human nature, and is prone to label what it cannot comprehend as pathological; unmindful that in general one would prefer to be Pascal ill, than an ordinary person—well."

The principal features of the mental conditions of animals, apart from man, form the subject undertaken by Dexler (Prague). Our knowledge of the mental states of the lower animals is still in its infancy, and requires accurate and laborious experience on which to base any satisfactory conclusions. Even when stripped of individual imagination and well controlled, a certain amount of error cannot be avoided. The variety of animal organisation, and the absence of speech relations between man and animals, oblige one to analyse mental phenomena indirectly and in the light of one's own mental acts. Our knowledge of animal psychology is gained from experimental physiology or pathology. Dexler's work is largely based on the experiments of Mendel and Gerdes on animal paralysis; on the mental alienation caused by poisoning by morphine, cocaine, mercury, or autointoxications; on Nissl's work on the paralysis of dogs; and on symptoms of mental degeneracy, mania, and other mental affections in horses, etc.

In the historical summary with which he introduces the general etiology of mental troubles, and writing more particularly of the influence of surroundings on mental states, the editor points

out that the most ancient system of medicine known in the ancient world—Sushruta Sanscrit—placed the air among the principal causes of mental disease, and the influence on the brain of certain divinities which probably correspond to the stars was indicated. This system even made a distinction between certain forms of insanity according as they developed or became accentuated during the different phases of the moon. The ideas thus referred to, though slightly modified held sway in all civilised countries until recent times, and even yet they mingle in the treatment of mental disease, and will only be dissipated by further scientific study of the influence of climate and surroundings on the mind. The reader who wishes guidance on the most recent discoveries in these matters cannot fail to profit largely by perusing the information afforded in this part of the treatise.

The final chapter of the volume is concerned with laboratory work, and describes the numerous reaction time instruments and varied clinical apparatus which have been adopted to amplify our knowledge of mental disease. The volume is extensively and beautifully illustrated, and is a storehouse of suggestion and information. A detailed index to each volume, or to the completed work, would be of much use to the reader.

HAMILTON C. MARR.

**BRAIN AND SPINAL CORD.** A manual for the study of the (536) morphology and fibre-tracts of the central nervous system. EMIL VILLIGER. Translated by GEORGE A. PIERSOL from the third German edition: with 232 illustrations. J. B. LIPPINCOTT, Co. Philadelphia and London, 1912. Pr. 16s. net.

THE translation of this book into English places in the hands of those who do not read German one of the best of the recent works upon the anatomy of the central nervous system. It is a book which may be confidently recommended to anyone wishing a good text-book on this subject. The conciseness and brevity which are so characteristic of the original have been carefully preserved in this translation. The general appearance of the book closely approximates to the German edition, the plates being clearly reproduced, their value in many cases being greatly increased by the introduction of two or three colours; in fact, one would even wish that this had been more extensively used.

The book is divided into three parts. The first deals with the morphology of the central nervous system. The development of the different parts of the brain are clearly shown, the different structures developing from the three primitive cerebral vesicles being accurately explained. These are then described in detail, a

large amount of useful information being successfully compressed into a small compass.

Part II. deals with the fibre tracts. It commences with a short description of the different methods by which these tracts have been studied. This is followed by a brief account of the structure and appearance of the nerve cell. The layers of the cerebral cortex are then considered, followed by a short section on cerebral localisation. The association, commissural, and projection fibres are then described, the diagrams illustrating the different paths of these tracts being specially good and concise. The cerebellar cortex and fibre tracts are next considered, followed by the spinal cord and the medulla oblongata. The cranial nerves are then discussed, and this part comes to an end with a summary of the chief tracts.

Part III. consists of a number of figures illustrating two series of serial sections of the brain stem of a four year old child. The first series, of 28 figures, extends from the anterior end of the corpus callosum to the quadrigeminal region; the second series, of 21 figures, is from the caudal end of the medulla oblongata to the quadrigeminal region. A short description is given below each figure, so that it is easy to identify the different structures.

No references to literature are anywhere given in the text, but the translator has added a number of selected references. There is a good index.

We have no hesitation in recommending this book to anyone wishing a short and concise account of the anatomy of the central nervous system. The type is good. It is a book which may be recommended both to the student and to the teacher. The translation itself has been well done, the book being easy to read and to understand.

A. NINIAN BRUCE.

**THE TREATMENT OF INFANTILE PARALYSIS.** OSKAR VULPIUS.

(537) Translated by ALLAN H. TODD, with introduction by J. JACKSON CLARKE. Pp. x. + 318; 243 figs. in text. London: Baillière, Tindall & Cox, 1912. Pr. 10s. 6d. net.

THIS work deals almost exclusively with the orthopedic treatment of the sequelæ of poliomyelitis, and is divided into two parts, the first of which is confined to general treatment, and the second to special treatment. There is a short introduction of twenty-five pages dealing with symptomatology, ætiology, and pathological anatomy.

The introduction is very brief, and it is a striking proof of the rapidity of the advance of our knowledge of this subject that part of it is already out of date.

The general treatment is discussed under the headings of (1)

general treatment in the acute stage and stage of repair during the first year of illness, (2) orthopedic apparatus, and (3) the surgery of paralysis, which is subdivided into (a) treatment of paralytic contractures and deformities, (b) restoration of function by muscle implantation, arthrodesis, tendon shortening, tendon transplantation, and nerve transplantation.

The special part is devoted to the treatment of the various parts—the neck, back and abdomen, shoulder, elbow-joint, hand and fingers, foot, knee and hip; and the book closes with chapters on the treatment of shortening, and on paralysis of extreme severity. There is a good index, both of subjects and of names.

The book will specially prove of value to those interested in the surgical treatment of infantile paralysis. We should like to have seen more stress laid upon the prolonged and careful application of medical treatment, as we have seen many cases recover under such conditions which had been considered as hopeless. The illustrations are very numerous, and form such a complete series that they alone add great value to the book. The translation has been well done.

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**Review**  
of  
**Neurology and Psychiatry**  

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**Original Articles**  

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**A CASE OF TOXIC EXHAUSTIVE INSANITY,  
ASSOCIATED WITH CHRONIC SUPPURA-  
TIVE OTITIS MEDIA, LABYRINTHITIS, AND  
EXTRA-DURAL ABSCESS.**

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AND

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AND

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Aural Surgeon, Leith Hospital.

(With Plates 28 to 31.)

THE writers are indebted to Dr George M. Robertson, Physician Superintendent, Royal Asylum, Edinburgh, for permission to record the following case.

W. P., male, aged 42 years, labourer, married, was admitted to the Royal Edinburgh Asylum, Morningside, on 29th May 1912.

The history of the development of the case obtained from the patient's wife was unsatisfactory, as she was of very low-grade

mentality, and had not been especially observant. She stated, however, that the patient had always been a quiet, hard-working man, and had earned 15s. per week as a worker in a flock-mill.

They had no children, and the informant denied ever having had any miscarriages.

Six weeks previous to his admission to the Royal Edinburgh Asylum the patient had to give up work owing to a failure of his general physical health, and the doctor who attended him said that he was suffering from consumption. Gradually he became dull and apathetic, lay in bed all day long, had a very poor appetite, and *became too weak to walk*. No account could be got at this time in regard to the onset of a muco-purulent discharge from his left ear. Owing to his poor physical condition he was sent to Seafield Hospital, Leith, but after a few days' residence there he was transferred to the Royal Edinburgh Asylum on account of irritable, irrational behaviour. The medical certificates stated that sometimes he answered when spoken to, but usually took no notice of questions. He was described as rambling and incoherent in his talk, as tearing his bed-clothes, and frequently wetting himself.

On admission to the Royal Edinburgh Asylum (29th May 1912) he was in a dull, confused, irritable, dishevelled condition. He absolutely refused to co-operate in a mental examination, usually refused to answer any questions at all, or else when he did so replied in a flippant, irrelevant way, *e.g.* :—

"What is your address?" "Trilby! see your way to let me off this time. O God, help this sickness of mine."

"Do you feel happy?" "Yes."

"Feel sad?" "Yes."

"Which is it?" "The three of them."

"How long have you been sick?" "Fourteen hundred and eight."

"What do you mean?" "Seven, seven, seven, seven."

He seemed to realise that he was in a hospital, but owing to his attitude it was impossible to form any estimate of his memory or orientation. No delusions or hallucinations could be demonstrated at that time.

PHYSICALLY.—He was a white-faced, poorly nourished, degenerate man. His pulse was 72 per minute; temperature, 96·2; height, 5 ft. 3½ in.; weight, 7 stone.

He complained of *headache and dizziness*, showed a tendency to *fall backwards* unless supported, and when supported walked dragging his left foot, but his left arm was dependent and not in wing position as is seen in complete hemiplegia.

His pupils were equal and regular; their reaction to light and accommodation could not be determined owing to lack of co-operation. There was no paralysis of the external eye muscles, and no nystagmus.

He had a *purulent discharge from the left external auditory meatus*; his hearing could not be definitely determined, again owing to lack of co-operation, but it was not grossly disordered. There was no disorder of the other cranial nerves, no special tremors, and no disturbance of speech.

His tendon reflexes were exaggerated on both sides, but rather more so on the left side; there was no ankle clonus, and no sign of Babinski on either side. He showed numerous brownish scars on both legs which seemed to be of a syphilitic nature, but both he and his wife subsequently denied any syphilitic infection. There was no disorder of the internal organs.

During the week following his admission he continued to exhibit much the same condition. He was dull, irritable, and cantankerous; he refused to co-operate satisfactorily in any attempt to examine him, and when questioned buried his head in the bed-clothes and refused to answer. He was cleanly in his personal habits.

Gradually, however, under local treatment his ear condition began to improve, and his general physical and mental condition became so much better that on 18th June 1912 he was noted as co-operating much better than at any time previously. He now gave much the same account as that obtained from his wife in regard to the onset of his sickness, but could not be got to give any adequate explanation for his peculiar behaviour on admission.

When some of the odd statements which he had made were repeated to him he laughed, and said that he could not account for them. He now, however, answered all questions correctly, had a good appreciation of time, place, and person, and was able to give a fair account of his life. He realised that he had passed through an acute mental disturbance.

He was now able to be up and about the ward, assisted in



some of the simple ward work, and did not show any special abnormality of gait.

The examination of his cerebro-spinal fluid showed a negative cell count of 2 cells per c.mm., negative globulin reaction, and negative Wassermann reaction, both with the cerebro-spinal fluid and blood-serum.

A qualitative examination of the cell-content of the cerebro-spinal fluid by means of Alzheimer's method showed lymphocytes 62 per cent., large mononuclear cells 37 per cent., polymorphonuclear leucocytes 1 per cent.

No plasma, gitter, or macrophage cells were seen.

The patient continued to behave in a quiet way, and seemed to have recovered from his mental condition, but on 12th July—three days before death—he had a relapse, and suddenly became confused and irritable. He tore his bed-clothes, struck another patient without any provocation, either refused to answer any questions, or else answered them irrelevantly, and at nights was exceedingly restless and noisy. This condition lasted until the time of his death on 15th July 1912.

*Remarks.*—Clinically the explanation of such a case was exceedingly difficult. Owing to the old syphilitic(?) scars on the patient's legs, and the fact that he dragged his left leg in walking, it was thought that he might have some syphilitic affection of his nervous system. The entirely negative findings in the cerebro-spinal fluid and blood-serum made one feel justified, however, in absolutely ruling out such a diagnosis.

The clearing up of the ear symptoms under local treatment and the negative cerebro-spinal fluid findings also seemed to conclusively rule out any cerebral or cerebellar involvement due to abscess formation, so one was forced to make the more or less symptomatic diagnosis of a confused, irritable mental state developing on the basis of a low state of nutrition. The pathological and detailed examination of the left ear were, however, instrumental in throwing more light on the case.

**Autopsy Report.**—The autopsy showed a poorly nourished man with brownish scars on both legs. There was marked thickening of the left mastoid process, and pus was seen in the left auditory meatus.

*Heart.*—Weight, 10 oz. The heart muscle was pale and friable, and showed some fatty infiltration. The tricuspid valve showed

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FIG. 1.—NORMAL RIGHT EAR. No.

1. Tensor tympani.
2. Apical coil of cochlea.
3. Middle coil.
4. Cochlear nerve in internal meatus.
5. Cranial end of aqueduct of cochlea (perilymph).
6. Lower part of basal coil of cochlea.
7. Carotid canal.
8. Tubal portion of tympanic cavity.

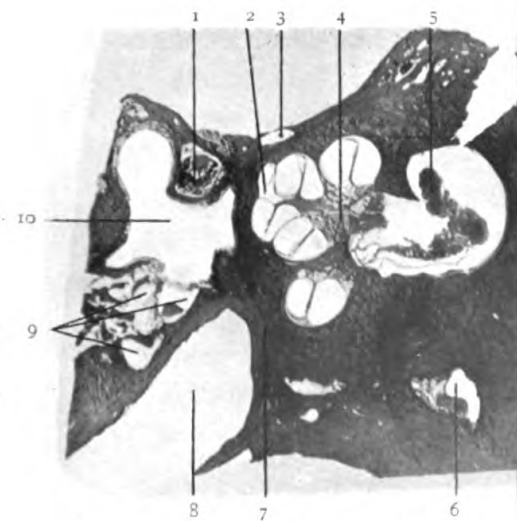


FIG. 2.—NORMAL RIGHT EAR. No.

1. Tensor tympani.
2. Helicotrema.
3. Canal for great superficial petrosal nerve.
4. Modiolus.
5. Facial nerve.
6. Cochlear aqueduct.
7. Line of junction of lamellar bone of carotid canal and cartilage bone of cochlear capsule.
8. Carotid canal.
9. Tubal air cells.
10. Tubal part of tympanic cavity.

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an *acute endocarditis* with, in addition, small inflammatory hæmorrhages on the cusps; the pulmonary cusps were acutely inflamed; the mitral valve showed some chronic endocarditis; the aortic valve showed no abnormality.

The first part of the thoracic aorta showed some calcareous plaques.

*Respiratory System.*—Left lung: weight, 16½ oz. This lung was emphysematous throughout. There was no tubercular focus, and no congestion.

Right lung: weight, 25 oz. This lung showed an acute venous congestion of the lower and middle lobes, but there was no actual consolidation. There was no evidence of any tubercular process.

The kidneys, liver, and spleen all showed a slight degree of chronic congestion.

*Nervous System.*—The dura mater did not seem at first to present any abnormality, but a later and more detailed examination showed that its outer surface was greatly thickened over the roof and posterior surface of the left inner ear, and infiltrated with pus. The pia arachnoid was slightly thickened. The brain weighed 42½ oz., and presented no gross abnormality in the way of atrophy of the convolutions, foci of softening, &c. There were no granulations in the floor of the fourth ventricle. The vessels at the base showed a slight degree of atheroma.

There was no evidence of any abscess formation in either the cerebrum or cerebellum, and on section of the brain no focus of infection was found.

Sections were taken from the frontal, precentral, parietal, occipital, and temporo-sphenoidal regions. On microscopical examination the nerve cells were found to be swollen, and showed a fairly diffuse chromatolysis, but they did not seem to be decreased in number, and their layering was not disordered. In the large Betz cells in the motor region the nucleus stained darkly, and a moderate degree of axonal reaction was seen. There was no proliferation of the neuroglia, and no new vessel formation.

*Remarks.*—In the light of the above findings it seems reasonable to suppose that the sudden relapse of the patient was due to an acute extension of the toxic process in the left ear setting up an acute endocarditis, and secondary congestive processes in the lungs, kidneys, liver, and spleen. A pure culture of *Streptococcus*

*pyogenes* was obtained from the right lung, and it was unfortunate that cultures were not also obtained from the heart and ear.

The nerve-cell changes seen in the cortex were quite typical of those obtained in acute toxic-exhaustive states.

D. K. H.  
W. M.

*Examination of the Left Temporal Bone, and Left Middle and Inner Ear.*

(For purposes of comparison, photo-micrographs made from sections obtained from the normal right ear of another patient are reproduced alongside of those showing the condition of the diseased left ear of the present case, W. P. The photo-micrographs are made from the two ears at more or less corresponding points. All the sections are cut vertically from before backwards, at right angles to the long axis of the petrous pyramid, and are viewed as they would appear to an observer standing in front of the patients; thus the normal right ear is on the reader's left, while the diseased left ear is on the reader's right.)

*Naked Eye Appearances of Diseased Ear.*—The dura mater in the floor of the middle fossa is greatly thickened where it covers the left tympanic cavity and labyrinth (pachymeningitis). On the posterior surface of the petrous bone the dura is also thickened above and behind the internal auditory meatus. The extra-dural abscess above and behind the labyrinth has been opened in removing the brain, but still contains pus (Figs. 5a and z) which, due to the formalin fixation, presents a putty-like character. The sacculus endolymphaticus appears normal, and, when opened, is found to contain no pus. The left tympanic membrane is much retracted, and the outline of the malleus can only be made out with difficulty. The tympanic membrane does not give when touched with the probe. There is slight thickening in the roof of the jugular bulb, but there is apparently no general thrombosis of the bulb itself.

*Microscopic Examination of the Middle Ear.*

*Tubal Part of the Tympanic Cavity* (Fig. 1a).—The superficial epithelium presents an almost normal appearance. The submucous tissue is greatly thickened, and shows areas of round cell infiltra-

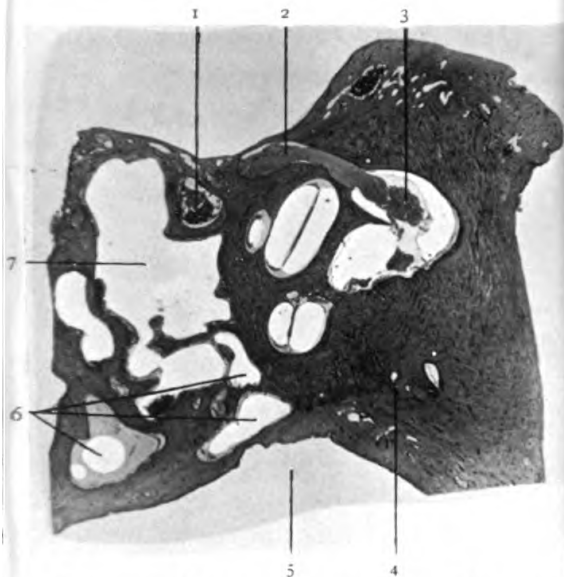


FIG. 3.—NORMAL RIGHT EAR. No. 175.

1. Tensor tympani.
2. Facial nerve passing above cochlea.
3. Vestibular ganglion.
4. Cochlear or perilymphatic aqueduct.
5. Jugular bulb.
6. Air cells in floor of tympanic cavity.
7. Tympanic cavity.

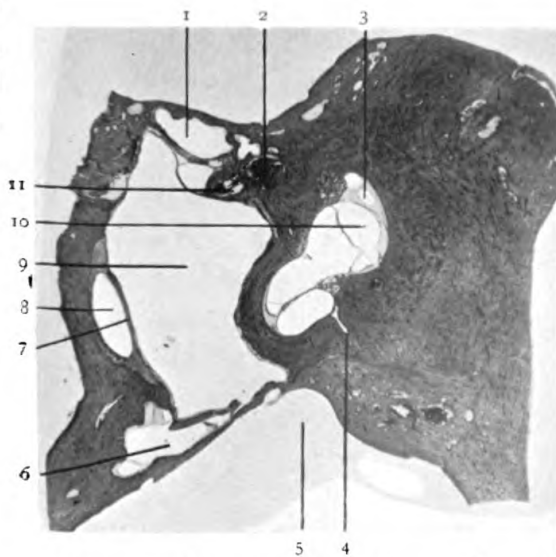


FIG. 4.—NORMAL RIGHT EAR. No. 244

1. Anterior part of epitympanic cavity.
2. Facial nerve.
3. Anterior part of utricle.
4. Cochlear opening of perilymphatic duct.
5. Jugular bulb.
6. Tympanic air cell.
7. Tympanic membrane.
8. External meatus.
9. Tympanic cavity.
10. Sacculus.
11. Tensor tympani.

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tion. The lumen of the tubal part of the tympanic cavity contains homogeneous or finely granular exudate, which stains deep pink with eosin. The air cells in the floor of the tubal portion of the tympanic cavity are greatly narrowed by fibrous thickening of the submucosa.

*Meso-Tympanic Cavity.*—The tympanic membrane is greatly thickened (Fig. 6a), and is in places adherent to the inner wall of the tympanic cavity, which is greatly reduced in size by fibrous thickening of the submucosa. In this thickened submucosa there are areas of dense small cell infiltration (abscesses?). This is especially seen in the region of the promontory where there are still the remains of a fistula into the basal coil of the cochlea (Figs. 3a and 4a). What is left of the tympanic cavity contains a homogeneous or finely granular exudate (Fig. 6a) similar to that seen in the Eustachian tube. There is a considerable amount of new bone formation in the walls of the tympanum. In the thickened submucous tissue there are numerous cystic spaces filled with exudate (Figs. 4a and 7a). The remains of a small perforation of the tympanic membrane can still be made out posterior to and below the handle of the malleus (Fig. 5a).

*Epi-Tympanic Cavity.*—The attic is narrowed by fibrous thickening of the submucous tissue (Fig. 6a).

*Hypo-Tympanic Cavity.*—The cellar, *i.e.*, the tympanic cavity below the level of the membrane, is entirely obliterated by the marked fibrous thickening of the submucous tissue (Figs. 4a and 6a).

*Tympanic Ossicles and Muscles.*—The *malleus* is present, but the head shows extensive erosion of the joint surface (Fig. 6a), and is adherent to the inner wall of the attic by means of vascular fibrous tissue which has probably replaced the body of the incus.

The body of the incus, along with the short and long processes, has entirely disappeared, but the joint between the incus and stapes remains.

The stapes is present and, though embedded in thickened mucosa, appears normal (Fig. 5a). The stapedius muscle appears normal, but the tensor tympani is slightly atrophic.

*Oval Window.*—There is no perforation of the fenestra ovalis, but the mucous membrane and submucous tissue of this region are markedly thickened (Fig. 5a).



*Round Window.*—The niche of the round window is entirely filled up by fibrous thickening of the submucous tissue (Fig. 5a). The secondary tympanic membrane is incorporated in the fibrous tissue, which fills the scala tympani and the round window niche.

*Aditus and Antrum.*—These spaces, like the tympanic cavity itself, are almost entirely obliterated by fibrous thickening of the submucous tissue (Fig. 7a).

*Labyrinth Capsule.*—The inter-globular space bone, which is formed from the original cartilaginous capsule of the labyrinth, is very irregular. This is well seen around the basal coil of the cochlea, where the normal line of demarcation between the cartilage bone and the lamellar bone is very indistinct and irregular (perilabyrinthitis, Fig. 1a). In the posterior wall of the vestibule the cartilage bone has been eaten through, so that the contents of the vestibule are in contact with the extra-dural abscess described below (Figs. 5a and 6a). The smooth end of the external semicircular canal also shows some irregularity of its wall.

The lamellar bone which surrounds the cartilage bone is very vascular, and is markedly thickened on the inner wall of the tympanic cavity.

An extra-dural abscess is present in the floor of the middle fossa, and also in the posterior fossa behind and above the internal auditory meatus (Figs. 3a, 4a, 5a, and 6a). In the middle fossa the abscess extends forward above the cochlea and outwards to reach the geniculate ganglion (Fig. 4a). Posteriorly the abscess extends above the superior semicircular canal. The bony covering of the cochlea, vestibule, and superior canal is markedly eroded by this extra-dural abscess.

Posteriorly to the internal meatus there is a track of fibrous tissue leading from the extra-dural abscess of the middle and posterior fossæ downwards to the roof of the jugular bulb (Fig. 2).

Pus formation can be seen in the labyrinth nucleus in the region of the fossa subarcuata beneath the dome of the superior canal.

### *The Labyrinth.*

*Cochlea—Basal Coil.*—The endosteum of the cochlea is greatly thickened, and the outline of the endosteal bone, which lines the cochlea, is rough and irregular on account of new bone formation

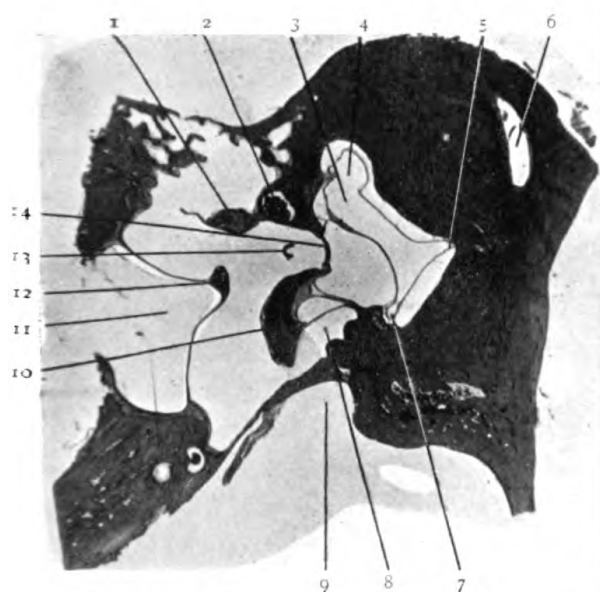


FIG. 5.—NORMAL RIGHT EAR. No. 295.

1. Tendon of tensor tympani.
2. Facial nerve.
3. Utricle.
4. Ampulla of superior membranous canal with crista.
5. Opening of crus commune.
6. Superior canal.
7. Sinus of posterior canal with crista quarta.
8. Niche of round window.
9. Jugular bulb.
10. Promontory.
11. External meatus.
12. Handle of malleus attached to drumhead.
- 13 and 14. Head and foot plate of stapes.



FIG. 6.—NORMAL RIGHT EAR. No. 352.

1. External attic.
2. Head of malleus.
3. Facial nerve.
4. Two ends of external canal.
5. Superior canal.
6. Remains of fossa subarcuata in labyrinth nucleus.
7. Ductus endolymphaticus.
8. Two ends of posterior canal.
9. Jugular bulb.
10. Hypotympanic cavity.
11. External meatus.
12. Tympanic membrane.
13. Stapes.
14. Prussac's space.

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(Fig. 1a). The basal coil of the cochlea is filled with fibrous tissue in which much new bone has been deposited. The lower part of the basal coil is entirely replaced by new bone (Figs. 2a and γ). The scala tympani shows more formation of new bone than the scala vestibuli. Below and in front of the round window there can still be seen the remains of an old fistula from the tympanic cavity, which has opened into the scala vestibuli and scali tympani of the basal coil (Figs. 3a and 4a). A slender process of fibrous tissue can be seen extending from this region downwards and inwards through the bone towards the jugular bulb (abscess track along venous route?). There is also a track of fibrous tissue from the inner wall of the tympanic cavity and basal coil inwards to the fundus of the internal meatus.

*Middle Coil.*—This has evidently been less severely affected than the basal coil, for although it shows some new-formed fibrous tissue and bone, the scalæ are mainly filled with homogeneous material. The cochlear duct is markedly dilated in this coil (Fig. γ): Corti's organ and the membrana tectoria have entirely disappeared. The fibrous tissue in the scala tympani contains many new-formed blood-vessels, and the outline of all the scalæ are irregular at parts on account of the contraction of new fibrous tissue and the formation of new bone.

*Apical Coil.*—This region is even less affected than the middle coil, and there is no new bone formation. The three scalæ are, however, filled with homogeneous exudate.

*The Aqueduct of the Cochlea.*—At the site of the opening from the scala tympani the perilymphatic aqueduct is entirely obliterated by new bone formation, although the outline of the opening can still be seen (Fig. 4a). Lower down there is considerable thickening of the lining membrane of the duct—the lumen of which contains some pus cells. At the cranial end the fibrous thickening is very marked (Fig. 1a).

*Modiolus.*—The central canal, spiral canal, and hollow spaces of the bony spiral lamina are all filled with new-formed fibrous tissue which replaces the nerves and ganglia (compare Fig. 2a with Fig. 2). A considerable quantity of brownish pigment is present in the hollow spaces of the modiolus and bony spiral lamina.

*The Vestibule.*—This cavity is almost entirely filled with new fibrous tissue, in which there is very little new bone formation (Figs. 5a and 6a). Just above the secondary tympanic membrane

there is, however, a mass of new-formed bone (Fig. 5a). The utricle and saccule have disappeared, and are replaced by fibrous tissue. Here and there in this tissue small collections of round cells (remains of abscesses) may be seen. On the inner wall of the vestibule towards the roof the bone has disappeared, so that the fibrous tissue filling the vestibule is in contact with the extra-dural abscess in the floor of the middle fossa. This breaking-through appears to have occurred in the region of the common opening of the superior and posterior canals (*crus commune*) (Fig. 5a). The smooth end of the external canal also shows some erosion of bone. The aqueduct of the vestibule cannot be recognised at the vestibular end. The lower part of the ductus endolymphaticus, along with the saccus, appears to be normal.

*Semicircular Canals.*—The canals are less affected than the other parts of the labyrinth (Fig. 7a), and in places the membranous canals can still be seen. The perilymphatic space of all canals contains pus and exudate, in which a little new-formed fibrous tissue may be seen. There is some erosion of the bony lining of the external semicircular canal at its non-ampullary end.

*Internal Auditory Meatus with Seventh and Eighth Nerves.*—The dura mater lining the internal meatus is greatly thickened, and shows marked small cell infiltration as well as numerous dilated blood-vessels (Figs. 1a and 2a). The bony floor of the meatus is markedly eroded and presents a small abscess near its cranial end. Towards the inner end the superior wall of the bony meatus is perforated, so that the extra-dural abscess in the middle fossa is in direct contact with the dura lining the upper wall of the internal auditory canal. Numerous pus cells are present between the thickened dura and the remains of the eighth nerve. The two divisions of the eighth nerve can hardly be recognised, as they are incorporated with the granulation and fibrous tissue which fills the meatus. The vestibular nerve to the utricle is replaced by fibrous tissue. Traces of the vestibular ganglion can still be seen, and some fibres of the cochlear nerve can be traced from the internal meatus to the modiolus. The facial nerve, on the other hand, appears more normal, and in sections stained by the iron hæmatoxylin method (Fig. 7) the nerve can be traced through the meatus up to the geniculate ganglion. This latter structure is in contact with the pus of the extra-dural abscess in

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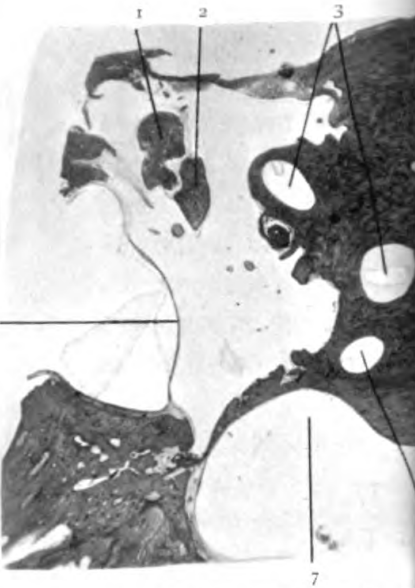


FIG. 7.—NORMAL RIGHT EAR.

1. Head of malleus.
2. Body of incus.
3. Two ends of external canal.
4. Air cells behind labyrinth.
5. Saccus endolymphaticus.
6. Two ends of posterior canal.
7. Jugular bulb.
8. Tympanic membrane.



FIG. 8.—DISEASED LEFT EAR.  
(Section stained by iron-haematoxylin.)

1. Facial nerve well stained. Below and behind cochlear nerve is not stained, and small.
2. Modiolus.
3. Dilated cochlear duct of middle coil.
4. Tensor tympani.
5. Tympanic cavity.
6. Carotid canal.
7. Basal coil of cochlea replaced by new bone.
8. Jugular bulb.
9. Aqueduct of cochlea.

there is, however, a small utricle and a small amount of tissue. Here the cells (remain in the vestibule the fibrous tissue is extra-dural all through the opening of the (Fig. 5a). There is erosion of bone at the vestibule along with the

*Semicircular*

other parts of the membranous canal all canals contain fibrous tissue lining of the end.

*Internal*

The dura mater and shows no dilated blood vessels. The meatus is at the cranial end. The meatus is perforated. The fossa is in the internal between the two. The two divisions they are inclined which fills the replaced by fibrous still be seen, and from the internal the other hand the iron hæmorrhage through the structure is in

the floor of the middle fossa. The lining of the facial canal is greatly thickened in the region where the nerve passed above the cochlea.

*Remarks.*—The writer is indebted to Dr G. M. Johnston, of Seafeld Hospital, Leith, for the following particulars of the case. The patient had suffered from a foul-smelling discharge from his left ear since boyhood. For some weeks before admission he had been in bad health, and a day or two before his arrival at the hospital he had suffered from severe pain in the ear, and from marked giddiness which had caused him to fall on one or two occasions. On admission (7th May 1912) he complained of pain in the left ear and headache, and tended to fall to one side (left?). He also suffered from hallucinations of hearing. At the time of the patient's admission to the Royal Edinburgh Asylum (29th May 1912) the effects of the labyrinthine attack were evidently passing off. Death occurred on 15th July 1912.

The case, therefore, was evidently one of chronic purulent otitis media on the left side of long duration, complicated in the beginning of May 1912 by an attack of acute purulent labyrinthitis. It is unfortunate that no functional examination of the ear was carried out, though it would probably have been impossible to test the patient's hearing, at any rate during the first part of his residence at the Royal Edinburgh Asylum. Functional examination of the vestibular apparatus by cold syringing, however, could have been carried out.

[The difficulty of making an accurate functional examination of the ear of insane patients will be obvious to all. Some years ago the present writer (J. S. F.) attempted to inquire into the condition of the ears of insane patients suffering from hallucinations of hearing, and examined twenty-two cases at the Royal Edinburgh Asylum. Of these, five presented gross abnormality of one or both tympanic membranes—perforations, scars, or marked retraction and opacity. In the great majority of cases, however, tinnitus aurium is due to a lesion of the cochlear ganglion and nerve, or to otosclerosis. In order to detect these conditions it is, of course, necessary to make an accurate functional examination by means of tuning-forks, watch, voice, Galton whistle, or monochord. Such an examination was quite out of the question in almost all of the twenty-two cases mentioned above, and the attempt to establish a pathological basis for the tinnitus was therefore abandoned.]



The character of the microscopic changes in the present case would appear to indicate that the inner ear had been affected for a period of about three months. The infection seems to have spread from the tympanic cavity to the labyrinth by erosion of the lower part of the basal coil of the cochlea. The usual sites of fistula formation, namely, the oval and round windows and the external canal, show no sign of perforation. The microscopic changes are most marked in the lower part of the basal coil of the cochlea and in the adjacent portions of the vestibule, as well as in the remainder of the basal cochlear whorl. In the canals the changes are less marked and less advanced than in the vestibule and cochlea. From the vestibule the pus seems to have spread to the sub-dural space by eroding the crus commune of the superior and posterior canals, and thence to have extended forwards and outwards over the cochlea and vestibule. The roof of the internal meatus appears to have been eroded by the extra-dural pus burrowing downwards.

The inflammatory process also appears to have passed inwards from the basal coil of the cochlea to the internal meatus in its lower part.

As will be seen from the photo-micrographs, the extra-dural abscess appears to be of much more recent date than the labyrinthitis. If this be accepted, it goes to support the view suggested by Drs Henderson and Muirhead, that the acute general infection from which the patient died was due to an acute extension of the septic process in the left ear.

In three similar cases of latent labyrinth suppuration, recently examined by the present writer, a cerebellar abscess was present, but in the case under consideration the brain appeared remarkably healthy.

In conclusion, the writer wishes to acknowledge his indebtedness to the Carnegie Trust for providing the illustrations.

J. S. F.

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**A GUIDE TO THE DESCRIPTIVE STUDY OF THE  
PERSONALITY. WITH SPECIAL REFER-  
ENCE TO THE TAKING OF ANAMNESES OF  
CASES WITH PSYCHOSES.**

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AND

DR GEORGE S. AMSDEN,

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FOR some years we have been interested in the study of the relation between personality and the psychoses. From the first of it the inadequate general statements concerning the personal constitution before the definite mental breakdown, set down even in very good anamneses, emphasised to us the need of some uniform way of collecting the data. The following guide represents our endeavour to meet this need. It is the result of many revisions and modifications suggested by the actual work. Our endeavour, then, started from the practical demand, in cases which come to the notice of the psychiatrist, for adequate anamneses referring to the period of the patient's life in which the compensation, so to speak, had not yet started to break down, *i.e.*, to the so-called normal period of the lives of such individuals, and not to the actual mental disorder in the stricter sense.

In this very period, however, there are frequently noted milder traits of a defect of adaptation, which still require more careful description and study than have hitherto been given them. While we have developed the guide in connection with an attempt descriptively to correlate the milder abnormalities and the psychoses, we have had in mind also studies which aim at a clearer clinical description of these milder traits, with special reference to singling out reactions appearing in very early life, which may serve as signals warning of future nervous or mental ill health. We hope, therefore, that the guide may be of use in the study of abnormal and nervous children. Those also who

work on problems of inheritance of specific mental traits may perhaps obtain some help from it, at least so far as the more affective factors of the mental make-up are concerned.

We have now quite a number of intelligence tests which, if correctly used, are of considerable importance in the characterisation of deficient individuals, but we lack tests for the much more difficult sizing up of the personality so far as the more affective reactions are concerned. It will probably always be impossible to devise tests of this sort, because the situations which call forth such reactions are too complex and often too subtle to be reproduced experimentally, or if anything like them were reproduced, they would still be artificial and lack the real flavour after all. Therefore, it is necessary to depend upon a collection of reactions as they occur, habitually or episodically, under the various conditions of actual life. For this reason, some such guide as the one we have here elaborated might be used in place of a test for the more affective, and therefore, so far as the behaviour and the balance of the individual are concerned, for the more important and more dynamic reactions.

The question as to what should be taken up in such an inquiry was at first not so simple to answer. Academic psychology gave us no help, and we had to be guided entirely by our clinical experience. The problem was to size up, as much as possible, the habitual reactions of the individual—that is to say, the various mechanisms of adjustment and adaptation brought into play in the more specific affective responses, in other ways used by the individual in dealing with situations, or in various ways of escape. It is clear that all that which refers to the sexual instinct had to be fully considered.

We did not at first consult any similar attempts of this sort, and later in looking over some questionnaires devised for the collection of mental traits, we found relatively little help, not because these did not contain much valuable material, which is undoubtedly very useful for certain kinds of study, but rather because we found little in them which was truly helpful for the purpose in hand, namely, for the collection of traits which influence the mental balance for better or worse. The chief points which have been added later refer to factors upon which psychoanalytic teaching has laid stress as being of considerable importance, and which our own experience has taught us to value

as indispensable additions to the anamneses of psychoses, or for that matter, for a characterisation of any personality.

With the final grouping of the questions it is probably not difficult to find fault, and undoubtedly changes might be made. Such matters can, however, not be grouped in the form of exclusive categories, and where everything is so intimately interwoven, and where it is often a question of shading off in different directions, as it is here, it would seem absurd to follow anything like a logical system, and much more to the point, to group the questions about certain general topics without too much concern about inconsistencies or even repetitions. The arrangements of the groups are again the outcome of practical needs and practical experience obtained in the actual work of establishing facts in the anamneses of patients.

We have mentioned the fact that we were particularly interested in the more affective reactions of the individual. It is important, however, first to inquire into those traits which primarily refer to the intelligence and the relative capacity for the output of energy and activity. In both these fields we find, of course, that affects may exert a very decided modifying influence. Nevertheless, they represent the most easily accessible measures of native endowment of the individual, and furnish in practical work a valuable indication of the general level upon which the individual stands. An inquiry into traits referring to this field should, therefore, form a starting point in the sizing up of the personality. We try to get an estimate of the capacity of the subject for acquiring knowledge, of the traits referring to judgment, and of indications which the standing in school, or later in life, the efficiency in work, as well as the general sizing up of the individual's "sense" by his friends, &c., furnish us. The second section of the guide refers to the habits of the individual in the output of energy.

Before taking up the mood and the more specific adaptability to environment, it has been found advisable to inquire first into the subject's estimate of himself as expressed in such traits as self-reliance, self-depreciation, conceit, or self-pity, and the like. In studying the habitual attitude towards the environment we take up the more specific traits of the personality which stand as coefficients for good or poor facility for adaptation: in the first

place, the more striking and the more general characteristics which, on their abnormal side, interfere in a definite manner with contact with the outside world, such as a general tendency to shun society. There are also traits which in a more specific but less obvious way accomplish similar results. Such traits are selfishness, suspiciousness, jealousy, &c. This leads over to traits from which we gather to what extent the subject lays bare to others his real self, that is, openness, reticence, and the like. Then we have taken up traits, such as conscientiousness and scrupulousness, which, in their normal development, are useful qualities, but which, in their exaggerated form, work somewhat in the same way as those just mentioned, or, at any rate, interfere with efficiency. In this connection also we have studied traits which indicate a tendency either to an active shaping of circumstances, or to the reverse. Such traits are an inclination to lead, courage, &c. Finally, it is important to consider the more specific traits showing the attitude towards reality—such as a tendency to be fantastic, to day-dreaming, &c.

The group concerning the mood, which stands next, aims at determining the habitual or episodic reactions of elation or depression, and also at what may be called the more allopsychic negative moods, such as irritability. To this are added somewhat related mental traits, with, however, rather less active reactions as a rule, such as sensitiveness, touchiness, and so on.

The group following that descriptive of the mood deals with the more instinctive demands of the individual. Here are included traits which are more or less clearly related to the sexual instinct. Practical work has shown that it is wise to begin with affections of a sort which, on the surface at least, are not plainly sexual, such as friendship and affection for the members of the family. Then the more plainly sexual life is taken up—that is, the relation to the opposite sex, the character and frequency of love affairs, the attitude towards the partner in engagement and married life, the sexual demands proper, the attitude toward sexuality in general, including such traits as prudishness, and the like.

Finally we inquire into the subject's general interests—that is, his capacity for sublimation, his capacity for getting satisfaction from altruistic or higher interests, which represent important balancing factors in the mental economy.

## DESCRIPTIVE STUDY OF THE PERSONALITY 581

These are the main directions in which we feel the inquiry should run. We give in the following pages the guide in detail. This should not be looked upon as a questionnaire, but as a guide to be modified in individual cases. In the use of it cross references and many questions to check up the data should form an important part.

We would like to insist, especially in reference to the mood, and also in connection with such traits as reticence, stubbornness, sensitiveness, jealousy, &c., that it is of the utmost importance to inquire not only into the general type and characteristics of the reactions, but also into the circumstances under which the reactions occur, the causes, or at any rate the apparent causes, which seem to call them forth, and to give illustrative instances of them.

### I.—TRAITS RELATING ESSENTIALLY TO THE INTELLIGENCE, THE CAPACITY FOR ACQUIRING KNOWLEDGE, THE JUDGMENT, &C.

How easily did he learn—was it necessary for him to study very hard to keep up in school?

What was his standing in school? (School records.)

Did he keep up with his classes? If not, what was the apparent reason?

What did his teachers say about him?

Was he proficient in some subjects, deficient in others?

Is his education up to his opportunities?

Is his power of attention and concentration good or bad?

Does he observe well?

How capable is he in positions?

Is he considered to have good common sense?

Is his advice sought by others?

Is he quick, impulsive, or deliberate in his judgment?

Is he definite or vague of purpose?

Does he plan with good foresight?

How practical is he? Can he use tools well?

### II.—TRAITS RELATING ESSENTIALLY TO THE OUTPUT OF ENERGY.

In childhood was he lively, active at work and play, or lazy and sluggish?

In his play as a child what did he prefer? Did he exercise much imagination in it?

Is he naturally talkative, or inclined to be silent?

Is he energetic, or slow, or sluggish?

Does he show a tendency to overactivity, to much push and tension?

Is he active or overactive by fits and starts?

Does he spend his energy sensibly or in a desultory way?

### III.—TRAITS RELATING ESSENTIALLY TO THE SUBJECT'S ESTIMATE OF HIMSELF.

Is he self-reliant or self-depreciative (feeling of inferiority)?

How dependent is he for his comfort on the opinions which others hold of him?

Is he conceited, egotistic, given to self-admiration?

Is he vain, proud?

Does he pay unusual attention to his dress, is he foppish?

Is he honest with himself, does he emphasise his dislike for sham?

Does he seem to be genuine?

Does he blame others for his faults?

Is he inclined to pay much attention to his aches and pains—  
inclined to self-pity?

### IV.—ADAPTABILITY TOWARDS THE ENVIRONMENT.

(a) *The more striking traits which, on their abnormal side, interfere in a rather general and striking way with contact with the environment.*

Is he sociable, easy to get acquainted with, or does he hold people off?

Does he make friends easily?

If he prefers to be alone, how does he rationalise this? Are there special circumstances under which he goes away by himself (*e.g.*, when reprimanded, criticised, or when something is required of him)?

Is he bashful—at ease with strangers? Is there a marked difference in behaviour in his intercourse with friends, family, or strangers?

When a child did he play freely with other children?

(b) *Traits which in a more specific, but in a less obvious, way interfere with contact with the environment.*

- Is he selfish or sympathetic, kind-hearted, altruistic?
- Is he generous or penurious?
- Has he genuine respect for the rights of others?
- Is he tactful or offensive?
- Is he quarrelsome, or easy to get along with?
- Can he co-operate with others?
- Does he want his own way?
- Was he obedient when a child?
- Is he inclined to criticise others much?
- Does he take advice well, or does he always think he is in the right?
- Is he stubborn—set in his opinions?
- Does he allow his mistakes to be pointed out to him?
- Is he apt to blame others for his own mistakes?
- Is he trustful or suspicious?
- Is he resentful or forgiving?
- Does he hold grudges long?
- Is he easily offended?
- Does he see slights when none are intended?
- Is he jealous or envious?
- Does he think the world treats him ill?
- Does he feel satisfied with his environment—does he feel above it?
- Does he readily adapt himself to new environments (as being away from home, moving to new places, &c.)?

(c) *Traits which show to what extent the subject lays bare to others his real self.*

- Is there much known of his inner life, his views, mental attitudes?
- Is he frank and open?
- Has he or has he not a tendency to unburden himself to other people, or special people?
- Is he demonstrative?
- If reticent, is he reticent generally or in relation to certain topics? Is he more frank to certain people?



(d) *Traits which in normal proportions are useful qualities, but in exaggerated form interfere with efficiency.*

Is he conscientious—has he a natural feeling of responsibility, or is he unusually scrupulous?

Is he easily blocked in his activity by scruples and doubts?

Is he committed to a routine, or is he free and agile mentally?

Is he finicky in his demands for precision, system, or order?

Does he show an exaggerated demand for truthfulness and justice?

(e) *Traits which show a tendency to active shaping of situations, or the reverse.*

Is he inclined to be a leader or led?

Does he show much demand for self-assertion?

Is he courageous or cowardly?

Is he imitative—suggestible?

(f) *Traits showing the attitude towards reality.*

Does he take things as they are, or as he wants them to be?

Is he fantastic or over-imaginative?

Is he inclined to build air-castles; how strong is the tendency, and how much satisfaction does the subject get from day-dreaming?

Is he truthful or apt to lie?

#### V.—MOOD.

Is he cheerful, light-hearted?

Is he serious, or not inclined to take anything seriously?

Is he enthusiastic?

Is he jovial, bubbling?

Has he good sense of humour?

Is he optimistic, hopeful?

When such traits are present, are they more or less habitual, or do they come out only under certain circumstances?

How does he react to pleasure, good news, success? (Description of reaction.)

Is he despondent—has he a tendency to look on the dark side, brood?

Does he get despondent without apparent reason ?

Are there any topics he is especially inclined to worry about ?

When such traits are present, are they more or less habitual,  
or do they come out only under certain circumstances ?

How does he react to real trouble, such as bereavement, failure  
or success, responsibility ? (Description of reaction.)

Does he make attempts to overcome his despondency or  
worrying ?

Does he crave sympathy in his depression ?

Does he seem to enjoy his discomforts ?

Is he stable or variable in his mood, away up or away down ?

Does his mood change easily ?

Is he easily frightened ?

Has he a tendency to anxiousness, to forebodings ?

Are there special topics which bring out his anxiousness ?

When anxious, what is his reaction ?

Has his mood apparently been permanently influenced by any  
special occurrence or circumstance ?

Is he irritable, quick-tempered ?

Are there special topics or circumstances which irritate him ?

How does he react when irritated ?

Does the irritation last long ?

Did he have tantrums when a child ?

Is he patient ?

Is he sensitive, touchy ?

Is he fault-finding ?

Is he phlegmatic, indifferent ? Has this existed since child-  
hood ?

## VI.—INSTINCTIVE DEMANDS, TRAITS WHICH ARE MORE OR LESS CLEARLY RELATED TO THE SEXUAL INSTINCT.

### (a) *Friendship.*

Is he affectionate, demonstrative, or is he cold ?

Does he have many friends, or is he whimsical in making  
friends ?

Does he keep friends long, or does he give them up on slight  
provocation ?

Is he sentimental in his friendship ?

What qualities in others attract him ?

*(b) Attachment to members of the family.*

Does he resemble in his ways and characteristics other members of the family?

Does he show any marked preference for, or great dependence on, any member of the family, or marked antagonism? (Father, mother, older or younger brother or sister.)

Has there been a change in this respect between childhood and adult life?

What was his reaction to the death of any member of the family?

*(c) Attitude towards the other sex.*

*1. General.*

Is his personal attitude in harmony with his own sex? (Tom-boy, mollicoddle, mother's boy, mannish, effeminate.)

Is he natural and at ease with the opposite sex?

Is he or is he not especially attracted by the opposite sex?

Is he attracted by older or younger persons of the opposite sex?

Did he have many, few, or no love affairs?

Did the love affairs go deep, or were they rather perfunctory?

Is he sentimental?

When love affairs were broken off, what was the reason?

What was the reaction towards disappointments in love?

Was he decided or wavering when the question of engagement or marriage came up?

In marriage or other similar relationships, what is the attitude toward the partner? Is he affectionate, kind; or dissatisfied, irritable, fault-finding, jealous, over-anxious, indifferent, domineering—or, on the other hand, very submissive?

Is there, or is there not, a desire for children?

*2. Specific sexual demands.*

Is the demand for sexual gratification great or small? (Potency, psychic impotence, ejaculatio præcox, frigidity.)

Does the subject masturbate? If not, has he never masturbated, or when did he stop?

Are there any perversions?

3. *General traits derived from sexual instinct or reactions against its assertion.*

Was there much sexual curiosity ?

Does he talk much of sexual matters—tell suggestive stories ?

Does he indulge in gossip with a sexual colouring ?

Is he particularly innocent, modest, prudish ?

Does he show a special demand for nicety, neatness, cleanliness, moralising ?

Is he easily disgusted ?

Are there any idiosyncrasies towards food or odours ?

Is there any special tendency to cruelty, plaguing, tantalising ?

VII.—GENERAL INTERESTS.

Is he interested in his work—does he get satisfaction from it, or from other pursuits ?

Is he ambitious, and in what direction ?

To what extent has he been able to satisfy his ambition ?

Is he interested in sports or other diversions ?

What are his hobbies ?

Has he any fads ?

Does he read much, and what is the character of his reading ?

Is he religious, does he get comfort from his religion, or is his interest merely superficial ?

Does he show any vague gropings, such as spiritualism, occultism, theosophy, “deep subjects” ?

Is he superstitious ?

In what does he get his deepest satisfaction ?

VIII.—PATHOLOGICAL TRAITS.

Without going into the history of the disorder, it will often be found useful to amplify the guide by statements concerning more frankly pathological features,—such as criminal tendencies, tendencies to hallucinate without definite psychosis, phobias, disorders of appetite and sleep, night terrors and anxious dreams, nocturnal enuresis, tics, &c.

## Abstracts.

### ANATOMY.

**THE CEPHALIC NERVES: SUGGESTIONS.** ROBERT BENNETT  
(538) BEAN, *Anat. Record*, 1913, vii., July, p. 221.

THE cranial nerves need a reclassification. There are only four cerebral nerves proper. The olfactory bulb and tract is not a nerve but an outgrowth of the brain. The optic nerve is also not a nerve, but another outgrowth, the retina is a modified cerebral cortex, there is an association tract and a decussation. These nerves should thus be described with the olfactory apparatus and the optic apparatus. The tenth and eleventh cranial nerves should not be considered with the nerves of the head, because they are distributed to the neck, shoulders, and trunk, and form an intermediate stage between the cervical spinal nerves and cranial (why not cephalic?) nerves. The remaining eight nerves may be divided into four groups, and the author proposes to alter the terminology of the present so-called cranial nerves in the following manner:—

1. Call the nerves distributed in the head the *cephalic* instead of the cranial or cerebral nerves. The head includes the cranium and face, with the orbital, nasal, and buccal cavities as a part of the latter.
2. Omit the olfactory and optic nerves and describe them under their proper apparatuses.
3. Omit the pneumogastric and spinal-accessory nerves from the cephalic group because they belong to the spinal cord type, or may be considered as transitory nerves between the spinal cord and brain, and are not distributed to the head but to the neck, shoulders, and trunk.
4. Add three nerves to the cephalic group: (a) Add the motor root of the fifth and call it the masticator nerve; (b) add the sensory part of the facial, including the intermediate, nerve of Wrisberg, the geniculate ganglion containing the cells of origin of this nerve, and the chorda tympani, with its distribution in the tongue and palate; (c) add the nerve of the semicircular canals calling it the vestibular and separating it from the auditory.
5. Omit the sympathetic ganglia of the head, especially the ciliary, sphenopalatine, otic, and submaxillary, and constitute them

as a ganglionated cephalic plexus, including the sympathetic part of the geniculate, petrous and jugular ganglia, the prolongation upward of the cervical sympathetic system. The nerves as rearranged may be enumerated as the cephalic nerves:—

<i>Name.</i>	<i>Distribution.</i>	<i>Nature.</i>
Oculo-motor . . .	eye muscle . . .	motor.
Trochlear or pathetic . . .		"
Abducens . . .		"
Trigeminal or trifacial . . .	face . . .	sensory.
Masticator . . .		motor.
Facial . . .		"
Auditory or acoustic . . .	internal ear . . .	sensory.
Vestibular . . .		"
Glossopharyngeal . . .	tongue, palate, &c.	" (mixed).
Glossopalatine . . .		"
Hypoglossal . . .		motor.

Diagrams are given to illustrate the course and distribution of the masticator and glossopalatine nerves, and the ganglionated cephalic plexus and its connections. A. NINIAN BRUCE.

**THE NUCLEUS CARDIACUS NERVI VAGI AND THE THREE  
(539) DISTINCT TYPES OF NERVE CELLS WHICH INNER-  
VATE THE THREE DIFFERENT TYPES OF MUSCLE.**

EDWARD F. MALONE, *Amer. Journ. Anat.*, 1913, xv., July, p. 121.

THE histological character of a nerve cell is an indication of its function. This is seen in the dorsal motor (sympathetic) nucleus of the vagus, which contains centres for the control of both heart and smooth muscle. The nucleus ambiguus give rise to fibres which supply striated muscle. In the dorsal vagus nucleus two different types of cells are found. In the *lemur* and in *Macacus Rhesus*, the oral portion of this nucleus consists exclusively of small cells, and supplies smooth muscle. As one follows the nucleus caudally, a second type of cell begins to appear. In the *lemur* the large cells form a fairly compact group dorsal from the small cells; in the monkey their relative position is reversed. Proceeding further caudalwards, the small cells become fewer, and finally disappear, although a few transitional types are seen here and there. These larger cells supply the heart muscle. It is also to be noted that these larger cells are intermediate in histological structure between those supplying smooth muscle and those supplying striated muscle, a fact of interest, as heart muscle is histologically intermediate between the two other types of muscle.

Although not described in detail, coloured figures illustrating these three types of cells are given. A. NINIAN BRUCE.

- A CASE OF COMPLETE ABSENCE OF BOTH INTERNAL CAROTID ARTERIES, WITH A PRELIMINARY NOTE ON THE DEVELOPMENTAL HISTORY OF THE STAPEDIAL ARTERY.** A. G. TIMBRELL FISHER, *Journ. Anat. and Physiol.*, 1913, xlviii., Oct., p. 37.

THIS case was discovered at the autopsy upon a man, aged 39, who died from cerebral hæmorrhage. There were no symptoms during life. The brain weighed 1080 g. The external carotids were large and tortuous, and gave off their usual branches. There was no carotid canal in the petrous portion of either temporal bone. The basilar artery was nearly double its normal calibre, and ended at the upper border of the pons by dividing into the posterior cerebrals. On each side, from the point of anastomosis of the two posterior cerebrals, a slender artery proceeded forwards and outwards, occupying the position of the posterior communicating artery in the normal brain. They were occluded by concentric fibrosis. These slender arteries divided at the locus perforatus anticus into anterior and middle cerebral arteries. The latter are joined by the anterior communicating artery, which thus completes the circle of Willis. It is probable that the circulation in the anterior and middle cerebrals was mainly carried on through the anastomoses of the posterior and middle cerebrals through their temporal branches. The left temporal lobe presented a general shrinking without any alteration in the configuration of the convolutions, which were atrophied mainly at the expense of the grey matter, and were firm and hard, with the arachnoid and pia mater closely adherent.

The author thinks that the two internal carotids probably developed, but at a very early stage (about the 5 mm. period) they began to atrophy at about the point they divide into anterior and posterior branches.

A. NINIAN BRUCE.

## PHYSIOLOGY.

- THE PHYSIOLOGY OF THE POSTERIOR ROOTS IN THE LIGHT OF RECENT SURGICAL PROCEDURES.** J. STRICKLAND GOODALL and H. GASTINEAU EARLE, *Archives of Middlesex Hosp.*, 1913, xxix., p. 7.

THE operation of posterior root section has been performed for the relief of three conditions:—

1. Gastric crises of tabes.
2. Spastic paraplegia.
3. The pain of neuralgia and neuritis.

The immediate results of section of any posterior root are: (1) abolition of reflexes, (2) abolition of decerebrate rigidity (spastic paraplegia), (3) abolition of all sensation, including pain (apæsthesia). If the section be central, degeneration of the posterior root fibres takes place in the cord, and no regeneration occurs. If the section be peripheral to the ganglion, there is no central degeneration, only the peripheral fibres are affected, and if the cut ends are sutured together, regeneration can occur. The chief conclusions as to the present state of our knowledge of the physiology of the posterior roots in general are given, and the following points of importance to the surgeon pointed out: Section of all the posterior roots supplying a limb renders the limb quite useless. It not only destroys all sensation and all reflex action, but renders co-ordinate voluntary action impossible, while at the same time trophic disturbances also take place. On the other hand, section of some only of the roots, while reducing the total sensory innervation of the limb, will not render it useless and may prevent those impulses which are producing the abnormal condition from reaching the central nervous system.

The operation can be justified physiologically in the gastric crises of tabes, and in peripheral pain. In spastic paraplegia section merely substitutes a flaccid for a spastic paralysis, and all the roots must not be divided or voluntary and reflex movement will cease.

A. NINIAN BRUCE.

**REGENERATION OF AXIS CYLINDERS IN VITRO** (Second Communication). RAGNVALD INGEBRIGTSEN, *Journ. Exper. Med.*, 1913, xviii., Oct., p. 412.

PIECES of cerebellum and of spinal ganglia were taken from living etherised cats and guinea-pigs, and put directly into Ringer's solution, where they were cut, and from there transferred to coagulated plasma. Nerve fibres were found to grow out from those; they do not anastomose, and extend into the plasma unaccompanied by structures of any kind. The cultures were fixed by Held's pyridin method, and stained by Cajal's silver nitrate method. (*Cp. Review*, 1913, xi., p. 164). A. NINIAN BRUCE.

**THE CEREBRO-SPINAL FLUID.—I. SECRETION OF THE FLUID.** (543) W. E. DIXON and W. D. HALLIBURTON, *Journ. of Physiol.*, 1913, xlvii., Nov., p. 215.

THE principal new fact here described is that an intravenous injection of an extract of choroid plexuses (choroid gland) produces an increased excretion of cerebro-spinal fluid, as tested by the



rate of outflow through a cannula. This is not due to deficient absorption of the fluid, nor the results of alterations in respiration, or altered vascular conditions. The increased flow is equally well seen after the previous injection of atropine. Whether or not the hormone originates in the metabolic activity of the central nervous system, it is the case that extracts of brain produce the same effect on respiration, blood pressure, and on the flow of cerebro-spinal fluid as are produced by the choroid extract. The substance may be produced in the brain's metabolism and pass into the choroid plexus, or it may be produced primarily in the choroid epithelium, and occur secondarily in the cerebral tissue. The first is the more logical. The chemical nature of this substance, which is found in brain extract, in choroid extract, and in cases of general paralysis and brain softening where catabolic processes are excessive, is probably the same. It has a high molecular weight and resists boiling. Cholesterin is present in all the situations just mentioned, but the results of injecting a colloidal solution of cholesterin into the blood stream are not comparable with the choroid injection. Whatever the exact nature of this substance is, it appears to reach the choroid gland, to excite it to activity, and to accumulate there, as it can be extracted from it in relatively large quantities. It does not pass out into the secretion in recognisable amounts under normal conditions.

A. NINIAN BRUCE.

## CLINICAL NEUROLOGY

**ON DISEASES OF THE SPINAL CORD IN SMALLPOX.** (Über (544) *Erkrankungen des Rückenmarkes bei Menschenpocken.*) H. EICHHORST, *Deut. Arch. f. klin. Med.*, 1913, cxi., p. 1.

OUT of 904 cases of smallpox treated by Eichhorst between 1884 and 1912 only two presented diseases of the nervous system. One was a woman who developed an acute psychosis, with delusions of persecution in convalescence, and recovered after having been sent to an asylum. The other was the subject of this paper. A man, aged 40, in the desiccation stage of severe smallpox, developed symptoms of acute ascending myelitis, and died in three days from the onset. Necropsy: Macroscopically no change was found in the spinal cord, but microscopic examination showed that the spinal cord was invaded by numerous inflammatory foci irregularly distributed throughout its whole length. The lesions were most marked in the lumbar region, where the pia was also affected, and gradually diminished in the cervical region. In all the sections the anterior horns were most

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affected, but the lesions were not confined to them, but involved the white substance as well. The inflammatory foci consisted almost exclusively of uninuclear round cells. Examination for bacteria in the cord was negative. The toxin was probably conveyed by the blood to the cord, and led to the inflammatory changes, but it was impossible to say why this particular patient was affected, and why the lumbar position of the cord was principally involved.

J. D. ROLLESTON.

**HERPES FACIALIS IN DIPHTHERIA.** (Ueber Herpes facialis bei (545) Diphtherie.) F. REICHE, *Med. Klinik*, 1913, vi., p. 1407.

Of 4,830 diphtheria patients observed by Reiche in the course of 2½ years, 336 cases, or 6·96 per cent., showed herpes facialis. It was not present in 99 patients under 1 year, or in 16 over 50. 138 of the herpes cases were males, and 198 females. In 40·3 per cent. it occurred on the third day of the disease. It was slightly less frequent in the severe (6·24 per cent.) than in the moderate (8·01 per cent.) or the mild cases (7·42 per cent.). Like the abstracter (*v. Review*, 1907, v., p. 906), Reiche does not attach any prognostic significance to the eruption, nor associate it with the injection of anti-toxin.

J. D. ROLLESTON.

**THE PATHOGENY AND CLINICAL ASPECTS OF POST-DIPHTHERITIC CEREBRAL PALSIES.** (Zur Pathogenese und Klinik der cerebralen post-diphtherischen Lähmungen.) A. L. DYNKIN, *Jahrb. f. Kinderheilk.*, 1913, lxxviii. (Erg.-Heft), p. 267.

DYNKIN reviews the literature and records two personal cases.

1. Boy, aged 10 years. Severe faucial diphtheria, early cardiac dilatation and vomiting, right hemiplegia and aphasia on 20th day, palatal paralysis on 40th day. A relapse of diphtheria occurred two weeks after the first attack, but without complications, and without having any influence on the paralysis. On discharge from hospital the child could walk alone, but had contracture of the right hand.

2. Girl, aged 7 years. Severe faucial diphtheria, right hemiplegia and aphasia, accompanied by repeated convulsions, occurred on 17th day. Paralysis of soft palate on 24th day. Death from acute pneumonia a month after the onset of hemiplegia. The necropsy showed softening of part of the left parietal and occipital lobes, and no changes in the heart. Dynkin thinks that embolism was the probable cause of the hemiplegia in the first, and thrombosis in the second case. To the 69 cases of diphtheritic hemiplegia collected by the reviewer in 1909 (*v. Review*, 1909,

vii., p. 104), Dynkin adds 3 more from Russian literature. These, with the 2 here described, and with 11 collected since 1909 by the reviewer, make a total of 85 cases (*v. Review*, 1913, xi., p. 280).  
J. D. ROLLESTON.

**POST-DIPHTHERITIC BULBAR PARALYSIS.** (*Epidiphtherische (547) Bulbarlähmung.*) E. TRÖMNER and A. JAKOB, *Zeitschr. f. d. ges. Neur. u. Psych.*, 1913 (Orig.), xv., p. 18.

A GIRL, aged 8 years, six weeks after an attack of diphtheria, developed bilateral facial palsy and ptosis, without R.D. A few weeks later she had difficulty in swallowing and partial paralysis of the soft palate. Finally, an attack of suffocation occurred, followed by occasional rapid twitchings of the facial muscles and extremities, paresis of the right oculo-motor nerve, cardiac weakness, and death from broncho-pneumonia.

Histological examination of the medulla, spinal cord, and some of the peripheral nerves showed subacute inflammatory lesions limited to the blood and lymph channels and the surrounding parts. The changes in the bulb were more marked than in the peripheral nerves, and the facial and vagus were more affected than the vasculo-spinal.

The writers conclude that diphtheritic paralysis is due to central as well as to peripheral lesions, sometimes the former and sometimes the latter predominating.  
J. D. ROLLESTON.

**CHANGES IN THE HYPOPHYSIS IN DIPHTHERIA.** (*Über (548) Veränderungen in der Hypophysis cerebri bei Diphtherie.*) H. G. CREUTZFELDT and R. KOCH, *Virchow's Archiv*, 1913, ccxiii., p. 123.

THE writers summarise their paper as follows:—

1. In many cases of diphtheria the demonstrable changes in the heart are not sufficient to explain the severe atony of the vascular system.

2. The strongly hypertensive action of pituitrin in diphtheritic hypotonus suggests a participation of the hypophysis in this condition.

3. In seven out of nine cases who died of cardiac and vascular paralysis the writers found the elements of the pars intermedia severely affected.

4. In guinea-pigs infected with cultures of diphtheria bacilli the same degenerative changes were found in the pars intermedia as in the human subject.

5. Treatment by pituitrin and adrenalin represents the specific treatment for diphtheritic cardiac and vascular paralysis.

J. D. ROLLESTON.

**TYPHOID MENINGITIS AND THE MENINGEAL MANIFESTATIONS OF TYPHOID FEVER.** (Les méningites éberthiennes et les manifestations méningées de la fièvre typhoïde.) R. J. WEISSENBACH, *Gaz. d. hôp.*, 1913, lxxvi., p. 1631.

THE author adopts the following classification:—

1. Typhoid meningitis, properly so called, with presence of the typhoid bacillus in the cerebro-spinal fluid, and appearing either at the onset or in the course of typhoid fever.

2. Meningeal states observed at the onset, or in the course of typhoid fever, probably caused by the typhoid bacillus, but of which the pathogeny is not elucidated.

3. Typhoid meningitis independent of enteric fever, and occurring as the only or predominant lesion of typhoid septicaemia.

4. Meningitis in typhoid fever caused by other germs than Eberth's bacillus, *e.g.*, staphylococcus, streptococcus, pneumococcus, meningococcus, or tubercle bacillus.

Weissenbach mentions two peculiarities of the cerebro-spinal fluid in typhoid meningitis. 1. It agglutinates the typhoid bacillus, whereas in typhoid fever, uncomplicated by meningitis, the cerebro-spinal fluid contains no agglutinins, even when the blood serum has a very high agglutinative power. 2. The presence of an immune body (*sensibilisatrice*) which appears earlier than the agglutinins.

J. D. ROLLESTON.

**MENINGITIS IN AN INFANT CAUSED BY THE TYPHOID BACILLUS.** H. W. LYALL, *Journ. Med. Research*, 1912-13, xxvii., p. 457

A FEMALE child, aged 4 months, was admitted to hospital with signs of meningitis, and died a month later. The possibility of typhoid fever was overlooked, and a provisional diagnosis of tuberculous meningitis was made. Von Pirquet's reaction, however, was negative, and repeated lumbar punctures gave issue to a clear, sterile, practically cell-free fluid, always under tension. Only just before death did the fluid contain pus cells, and an organism which in its morphological and cultural characters and bio-chemical reactions corresponded to the *Bacillus typhosus*. The same organism was obtained from the nose before death, and in pure cultures from the brain, and spleen, and heart blood post

mortem. A diffuse purulent meningitis was found at the autopsy, but the characteristic lesions of typhoid fever were absent.

J. D. ROLLESTON.

**A CASE OF INFLUENZAL MENINGITIS.** ATHOLE ROSS and A. (551) EISDELL MOORE, *Brit. Med. Journ.*, 1913, Oct. 25, p. 1056.

A CHILD, aged 13 months, was admitted to hospital with rigidity, marked retraction and head twisted to the left, Babinski extensor and Kernig's sign positive. The cerebro-spinal fluid was turbid, under increased pressure, contained albumin, 85 per cent. of polymorphs, and a short aerobic bacillus. Animal inoculations were not performed. The bacillus was gram-negative, and in direct film preparations from the cerebro-spinal fluid only short bacilli within the limits of  $1.5\ \mu$  to  $2.5\ \mu$  were found, but on cultivation, long thread-like bacilli were observed.

A. NINIAN BRUCE.

**FATAL MENINGITIS FIFTEEN YEARS AFTER A BULLET WOUND OF THE BRAIN.** W. PASTEUR, *Archives of Middlesex Hosp.*, 1913, xxix., Oct., p. 14.

A BARBER, aged 39, was admitted to hospital in a semi-comatose state. Fifteen years previously he had tried to shoot himself with a revolver in the middle of the forehead. The condition suggested uræmia, and while the state of the kidneys was found post mortem to be consistent with such a view, death was found to have resulted from an extensive meningitis of the convexity of the brain. The base was healthy except under the left frontal lobe, and a small-bore bullet was found encapsulated in the under surface of the left temporo-sphenoidal lobe.

A. NINIAN BRUCE.

**EXPERIMENTS ON THE CULTIVATION OF THE MICRO-ORGANISM CAUSING EPIDEMIC POLIOMYELITIS.** SIMON (553) FLEXNER and HIDEYO NOGUCHI, *Journ. Exp. Med.*, 1913, xviii., Oct., p. 461.

THE authors have succeeded, by using human ascitic fluid as the culture medium, in isolating from the central nervous system of human beings and monkeys suffering from epidemic poliomyelitis a peculiar minute organism that has been caused to reproduce the symptoms and lesions of experimental poliomyelitis. The micro-organism consists of globoid bodies measuring from  $0.15\ \mu$  to  $0.3\ \mu$  in diameter, and arranged in pairs, chains, and masses

according to the conditions of growth and multiplication. The chain formation takes place in a fluid medium, the other groupings in both solid and fluid media. Within the tissues of infected human beings and animals the chains do not appear.

The micro-organism passes through Berkefeld filters, and the filtrates yield upon recultivation the particular organism contained within the filtered culture. Also, Berkefeld filtrates prepared from the nervous tissues of infected human beings and monkeys yield in culture the identical micro-organism.

By employing a suitable staining method the micro-organism has been detected in film preparations and sections prepared from human nervous tissues, and from the corresponding tissues of monkeys inoculated with the usual virus, or with cultures or filtrates prepared from monkeys previously injected with cultures. From all the infected materials mentioned, irrespective of the manner of their origin, the micro-organism has been recovered in cultures.

As this micro-organism exists in the infectious and diseased organs, and is not associated with any other pathological condition; as it is capable of reproducing, on inoculation, the experimental disease in monkeys, from which animals it can be recovered in pure culture, it fulfils the classical requirements, besides which it withstands preservation and glycerination, as does the ordinary virus of poliomyelitis within the nervous organs. Its anaerobic nature interposes no obstacle to its acceptance as the causative agent, since the living tissues are devoid of free oxygen, and the virus of poliomyelitis has not yet been detected in the circulating blood or cerebro-spinal fluid of human beings, in which the oxygen is less firmly bound.

Details of the method of cultivation and of staining the tissues are given.

A. NINIAN BRUCE.

**THE POLYNEURITIC FORM OF POLIOMYELITIS: A CLINICAL (554) AND PATHOLOGICAL STUDY.** S. LEOPOLD, *Amer. Journ. Med. Sc.*, 1913, cxlvi., p. 406.

A PREVIOUSLY healthy woman, aged 20, was suddenly seized with vomiting, fever, and pain in the head and back, followed a few days later by paralysis of the limbs and bladder. The left lower limb was completely, and the right lower limb partially, paralysed. Both showed areas of hyperæsthesia. The knee jerks were absent. There was also marked tenderness on pressure over the nerve trunks in the paralysed extremities, which persisted until death two months after the onset.

Necropsy: Heart, lungs, spleen, and liver normal. Cloudy swelling of kidneys. No exudation in cerebral or spinal meninges.

The lumbar cord was somewhat softer than the other portions, and showed on section a reddish-grey area in both anterior horns. Microscopically the anterior horns were found to be practically destroyed. Intense inflammation was found in the meninges and around the posterior roots. Only one peripheral nerve and part of a muscle were examined, which were taken from the anterior aspect of the right thigh near Poupart's ligament. The nerve showed no evidence of acute or subacute inflammation, and no distinct evidence of degeneration. Except that the striations were not sharply defined, the muscle was normal.

The pain in this case was caused by inflammation of the meninges and the swelling of the posterior roots, due to the round-celled exudation within them and the engorgement of their vessels.

J. D. ROLLESTON.

**THREE INTERESTING BRAIN CASES.** DAVID McM. OFFICER, (555) *Australian Med. Journ.*, 1913, ii., Sept. 27, p. 1227.

*Case I.* Boy, aged 13, was hit on left side of head. He walked home, went to bed, became very noisy, and later unconscious. On trephining, a rupture of the posterior branch of the middle meningeal artery was found with extravasation of blood into the middle meningeal fossa. Artificial respiration had to be performed during the greater part of the operation, but he made a good recovery.

*Case II.* A child, aged 9 months, fell out of bed. He seemed stunned at the time, and developed in succession nystagmus, twitching of right arm and leg, and paralysis of right side. At the operation, a depressed fracture of the left occipital bone was found. The bone itself was of almost papery thinness, and the fragments were elevated, and one or two removed. There were no fissures passing away from the depressed area to be seen.

*Case III.* A man, aged 37, suffered from Jacksonian epilepsy, which had been getting progressively worse. As the right side was affected, the left Rolandic area was exposed, but nothing found. The bone was found extremely thick ( $\frac{1}{8}$  inch) and ivory-like. The fits stopped for about four months after the operation. They then commenced again, and he died two months later.

A. NINIAN BRUCE.

**A CASE OF PITUITARY TUMOUR.** J. CATARINICH, *Australian Med. Journ.*, 1913, ii., Sept. 20, p. 1220.

THE patient was aged 44, a labourer, and suffered from time to time from attacks of depression during which religious ideas

became prominent. Later he developed occipital headache which became extraordinarily severe. Mental confusion became marked, which made an examination of the field of vision difficult. This was followed by amentia; his pulse dropped to thirty-three, and he died suddenly. There were no symptoms of acromegaly.

Post mortem there was found a small adenomatous tumour in the region of the pituitary—undoubtedly an overgrowth from the anterior part. It pressed on the optic chiasma, and indented the floor of the third ventricle.

A. NINIAN BRUCE.

**ON FAILURE OF VISION AND ITS TREATMENT IN PITUITARY (557) DISEASE.** H. CAMPBELL THOMSON and WILLIAM LANG, *Archives of Middlesex Hosp.*, 1913, *xxix*, p. 17.

FOUR cases are here described with varying degrees of bitemporal hemianopia. The treatment was the administration of thyroid, and it was found that three markedly improved, while in the fourth the progressive advance ceased.

This supports Cushing's view that the primary atrophy more often represents a physiological block to light impulses than an actual destruction of the nerves.

A. NINIAN BRUCE.

**CASE OF HYPERACTIVITY OF ANTERIOR LOBE, COMBINED (558) WITH DEFICIENT ACTION OF POSTERIOR LOBE.** E. C. WILLIAMS, *Brit. Journ. Child. Dis.*, 1913, *x*, p. 407.

THE patient was a boy, aged 13 years, whose grandfather was said to have been a very big man. Excessive growth began at the age of 9 years, with increase in height (anterior lobe activity) and adiposity of the feminine type (posterior lobe defect). Present height, 5 ft. 2 in.; weight, 10 st. 7 lb.; chest measurement, 35½ in.; umbilical measurement, 35 in. X-rays showed large size of hands, and tufting of the terminal phalanges. The skiagram of the sella turcica was indefinite. Extremities cold and blue; blood pressure, 115 mm. Hg.; genitals ill-developed. No local signs; no headache. Vision and fundi normal.

J. D. ROLLESTON.

**THE ETIOLOGY OF PERNICIOUS ANÆMIA.** J. T. PILCHER, *Amer. (559) Journ. Med. Sc.*, 1913, *cxlvi*, No. 2, August.

THE development of pernicious anæmia seems to depend upon a personal idiosyncrasy of certain individuals. It is thought that we must revert to an embryonic tendency for the real etiological factor.

D. K. HENDERSON.



**POSTERIOR SPINAL NEURECTOMY FOR THE RELIEF OF PAIN**

(56) **IN CERTAIN CASES OF INCURABLE CANCER.** Sir ALFRED PEARCE GOULD, *Archives of Middlesex Hosp.*, 1913, xxix., Oct., p. 1.

Two cases are described in which malignant disease of the lower cervical glands, secondary to cancer of the breast, was the cause of severe pain referred to the whole of the upper limb due to pressure on the brachial plexus. In both cases the cervical spinal nerves were exposed within the *theca spinalis* and the posterior roots of the nerves involved excised. In each case the pain, which was very severe, was immediately relieved, and the patients were grateful for the operation.

A. NINIAN BRUCE.

**NOTES OF A SUPPOSED CASE OF PELLAGRA.** ROBERT REID and (561) WILLIAM CALWELL, *Brit. Med. Journ.*, 1913, Sept. 27, p. 784.

A FARMER, aged 66, residing five miles from Belfast, suffered from a dermatitis during spring and autumn on the back of his hands and chin and mouth. His memory had recently failed, and he was somewhat nervous. There was a stream of water from some marshy ground piped into his yard, and used for farming purposes.

A. NINIAN BRUCE.

**A NOTE ON A CASE OF PELLAGRA.** EMMA M. JOHNSTONE, (562) *Lancet*, 1913, clxxxv., Oct. 18, p. 1114.

THE case was that of a woman admitted into Holloway Sanatorium for melancholia and delusions. She presented no definite physical signs of disease. Her mental state varied from mild exaltation to depression, and the delusions were mostly of an organic nature. Towards the end of May she was out in the sunshine and developed characteristic lesions of the face and hands. She had never been abroad nor eaten maize.

Very short notes on two other cases are given.

A. NINIAN BRUCE.

**THE RÔLE OF HYDROTHERAPY IN PELLAGRA.** GEORGE M.

(563) NILES, *Amer. Journ. Med. Sc.*, 1913, cxlvi., No. 2, August.

In pellagra there is a four-fold syndrome—gastro-intestinal, dermic, nervous, and psychic.

The author believes that a great many of the symptoms in all these fields may be benefited by some form of hydrotherapeutic procedure.

D. K. HENDERSON.

**THE EPIDEMIOLOGY OF PELLAGRA.** J. F. SILER and P. E. (564) GARRISON, *Amer. Journ. Med. Sc.*, 1913, cxlvi., No. 2, August.

THIS is the second and concluding part of this article, the first part of which appeared in the July number.

The authors did not discover any evidence pointing to a spring and fall recrudescence of the disease. If during the spring months precipitation is high, temperature low, and number of rainy days excessive, the appearance of acute symptoms in the skin is delayed.

In 83 per cent. of the cases the economic conditions were poor, and the disease was most prevalent among people of insufficient means.

In more than one-half of the cases the history was that of good health. Among adult females, those most affected were married women (86 per cent.), and 86 per cent. of the married women had borne children.

The most unsanitary condition found in the county is the absence of properly constructed privies. A second striking unsanitary condition is the almost complete absence of effective screening of dwellings. These two conditions present a situation highly favourable to the transmission of disease organisms eliminated in the excreta, both by direct contamination of food and person, and by insects.

Observations upon the use of the more common foodstuffs failed to discover any points of difference between pellagrins and non-pellagrins in the county, or any facts which would seem to explain the strikingly greater prevalence of pellagra among certain classes of the population. The limited use of fresh meats was the most striking defect in the general dietary.

Investigation of the kind, quantity, and quality of corn and corn products used in the county failed to bring to light any epidemiological evidence pointing to the agency of corn as an etiological factor in the disease. In two cases there was a definite history of no consumption of corn for two years prior to the onset of symptoms, and in several other cases, the amount of corn eaten was so small that the authors feel that the evidence is strongly against the hypothesis that corn products alone are the causative agents of the disease.

D. K. HENDERSON.

**THE ANALYSIS OF PELLAGRA AND THE MOSQUITO.** S. R. (565) ROBERTS, *Amer. Journ. Med. Sc.*, 1913, cxlvi., No. 2, August.

IN regard to the nature and cause of pellagra, Sambon has said that it is (1) an infectious disease, and (2) an insect-borne disease. The author believes, however, that the third idea advanced by

Samson, namely, that the simulum fly is the specific insect carrier, is open to much doubt, and he further believes that it is not nearly so apt to be the insect agent as is the mosquito.

Some of the objections advanced against the simulum theory are as follows:—

The disease appears in America chiefly in those who are not field labourers, and who are little exposed to its bite; pellagra occurs in sporadic cases in cities, among women who stay at home, and in asylums, where the simulum neither comes nor bites; it does not present the regularity of seasonal incidence, adults living through the winter, the repeated broods during spring, summer, and autumn in enormous numbers, as does the mosquito; it does not move in swarms far from its stream home, and, therefore, does not explain those cases arising at a distance from any running stream; it is more numerous in cold countries, and on the coast of all continents, while pellagra avoids cold climates and seeks the interior rather than the coast; as far as is known, the bite of the simulum is poisonous rather than infectious, bearing toxins rather than parasites.

On the other hand, analogies are drawn between pellagra and the mosquito-borne diseases.

D. K. HENDERSON.

**A CASE OF PRECOCIOUS ARTERIO-SCLEROSIS.** (*Sopra un caso (566) d'arteriosclerosi precoce.*) VINCENZO SCARPINI, *Rassegna di Studi Psichiatrici*, 1913, iii., Sett.-Ott., p. 372.

A DESCRIPTION of a case in a man, aged 22, causing death four years later from cerebral hæmorrhage. The author discusses the differential diagnosis from syphilitic endarteritis, and, from the autopsy findings, is inclined to lay great stress upon the significance of a previous nephritis.

A. NINIAN BRUCE.

**DIABETIC PARALYSIS OF THE EXTERNAL RECTUS.** (*Paralysie, (567) diabétique du moteur oculaire externe.*) E. GINESTORS, *Gaz. hebdomadaire des Sci. méd. de Bordeaux*, 1913, xxxiv., p. 410.

A CASE of paralysis of the left external rectus in a man, aged 68, in whom the diplopia caused thereby was the first indication of diabetes. Under appropriate diet and antipyrin the glycosuria and paralysis disappeared within a month.

According to Dieulafoy (1905) paralysis of the sixth nerve is the most frequent ocular palsy in diabetes, being three times as common as paralysis of the third nerve, whereas in syphilis and tabes partial or complete paralysis of the third nerve is more frequent.

J. D. ROLLESTON.

**REPORT OF A CASE OF MONOCULAR PARALYSIS OF THE**  
(568) **ACCOMMODATION DUE TO LUES.** J. W. DOWNEY, *Journ.*  
*Amer. Med. Assoc.*, 1913, lxi., Sept. 27, p. 1043.

A MAN who had syphilis five years previously, and been treated for it for eighteen months, suddenly developed a paralysis of accommodation of the left eye with a slight involvement of the sphincter pupillæ. The Wassermann reaction was positive. He was given an intravenous injection of salvarsan, and the condition completely passed off, the Wassermann reaction becoming negative.

A. NINIAN BRUCE.

**A STUDY OF THE SPIROCHÆTICIDAL ACTION OF THE SERUM**  
(569) **OF PATIENTS TREATED WITH SALVARSAN.** HOMER F.  
SWIFT and ARTHUR W. M. ELLIS, *Journ. Exper. Med.*, 1913, xviii.,  
Oct., p. 435.

THE serum of rabbits treated intravenously with neosalvarsan, and of syphilitic patients treated intravenously with salvarsan or neosalvarsan, has a definite spirochæticidal action upon *Spirochæta duttoni* (*v. Review*, 1913, xi., p. 548). A curative action of the serum of neosalvarsan-treated rabbits is exercised on mice infected with *Spirochæta duttoni*. The spirochæticidal action of the serum of salvarsan-treated rabbits and patients is markedly increased by heating at 56° C. for thirty minutes. The increased spirochæticidal action produced by heating is due in part to the destruction of some inhibitory substance contained in normal serum, and in part to a direct effect of the heat upon the serum and salvarsan mixture. Cerebro-spinal fluid does not contain the inhibitory substance present in normal unheated serum.

A. NINIAN BRUCE.

**THE EFFECT OF INTRASPINOUS INJECTIONS OF SALVARSAN**  
(570) **AND NEOSALVARSAN IN MONKEYS.** ARTHUR W. M. ELLIS  
and HOMER F. SWIFT, *Journ. Exper. Med.*, 1913, xviii., p. 428.

THE authors injected solutions of salvarsan and neosalvarsan in serum intraspinously in monkeys, and studied the irritating properties by the cell count in the spinal fluid. A count was made before treatment, two days after treatment, and again about a week later. The injection of even small quantities of salvarsan is very irritating (*v. Review*, 1913, xi., p. 548); 3.2 mg. caused in one monkey paralysis of the hind legs lasting for some months. Injection of 1 mg. of salvarsan and over produced in every case cell counts of over 1,000 per cm. The injections of neosalvarsan were, on the whole, less irritating.

Injections of neosalvarsan intraspinaly are not to be recommended, but favourable effects may be obtained from the injection of salvarsanised serum, the method being to bleed the patient one hour after an intravenous injection of salvarsan, separate the serum, and reinject this serum into the subarachnoid space.

A. NINIAN BRUCE.

**A NEOSALVARSAN FATALITY.** M. E. HAGERTY, *Journ. Amer. Med. Assoc.*, 1913, lxi., Oct. 4, p. 1294.

A MAN, aged 29, with a history of a primary chancre about five years before, was given mercury and pot. iod. for two years, after which treatment ceased. He then developed vague mental symptoms for which he was given 0.6 g. of neosalvarsan intravenously. He had no ill effects, and a second dose of 0.6 g. was given about six weeks later. There were no ill effects for about fifteen minutes, when he started to walk to his hotel, returned ten minutes later and collapsed on the floor. He died shortly afterwards, and at the post mortem death was considered to be due to acute arsenic poisoning. The author states that this is his first fatality after six hundred injections.

A. NINIAN BRUCE.

**DEATH AFTER A SINGLE INJECTION OF NEOSALVARSAN.**

(572) (Un cas de mort après une seule injection de néo-salvarsan.)  
PERRIER, *Journ. des Praticiens*, 1913, xxvii., p. 456.

A MAN, aged 30, was admitted to hospital with right hemiplegia with contractures and aphasia, which had developed suddenly a fortnight previously. No history could be obtained, but Wassermann's reaction was positive. The heart, lungs, and brain were normal. An intravenous injection of 0.40 g. salvarsan was given. Death, preceded by fever, perspiration, and coma, took place five days later. Post mortem no visceral lesions were found except in the brain. On the outer part of the left hemisphere the pia was adherent in places to the Rolandic and Sylvian fissures, and hæmorrhagic suffusion was noted all over the third frontal convolution. A small area of red softening was found in the upper part of the anterior limb of the internal capsule.

J. D. ROLLESTON.

**HYSTERIA WITH FEVER AND ANKLE CLONUS.** A. MYERSON, (573) *Boston Med. and Surg. Journ.*, 1913, ii., p. 194.

THE patient was an Irish girl, aged 22, whose symptoms of hysteria were persistent vomiting, variable losses of consciousness, without

epileptiform characteristics, hemianaesthesia, and mutism. The temperature on admission to hospital ranged from 99 to 100·2 by rectum. On the second day she became very restless, vomited continually, and the rectal temperature rose to 105·2. An hour later it was 100·2, and gradually became normal. On examination a fortnight later persistent unilateral ankle clonus (right) was found, in no way distinguishable from that found in organic disease. No other evidence of organic disease was present. Babinski, Gordon, and Oppenheim signs were negative. The fundi and cerebro-spinal fluid were normal, and Wassermann in the blood and cerebro-spinal fluid was negative. Recovery took place in five weeks.

J. D. ROLLESTON.

**ON HYSTERIA.** (Ueber Hysterie.) E. KRAEPELIN (of Munich), (574) *Zeitschr. f. d. ges. Neurol. u. Psychiat.*, 1913, xviii.

THE subject of hysteria is here treated in an extremely formal way, and the work of Freud and his school is discussed in a few sentences. For Kraepelin the emotional expressions of the hysterical represent an earlier stage in evolution—they are evidence of lack of development, and this fact explains their prominence in the adolescent period before adult interests and self-control have attained full development. Statistics show a great preponderance of hysteria before the age of 25, and evidently the disorder frequently disappears as the individual develops. Where the symptoms persist and distort the personality, we have a more serious condition. The author would therefore divide hysteria into developmental hysteria and degenerative hysteria. The rôle which alcohol plays as an etiological factor in the psychoses has always been emphasised by Kraepelin, and where alcoholic abuse is an etiological factor in the production of hysteria, he calls it alcoholic hysteria. A passing reference is made to traumatic and prison hysteria. A formal contribution of this nature with no case histories is a good example of a rather barren variety of psychiatry.

C. MACFIE CAMPBELL.

**HEREDITARY CONGENITAL WRY-NECK.** DAVID M. GREIG, *Brit. (575) Journ. Child. Dis.*, 1913, x., p. 337.

A RECORD of a family in which the maternal grandmother, mother, second daughter, aged 7 years, and second son, aged 2 years, were the subjects of left congenital wry-neck. The eldest daughter, aged 10, and the eldest son, aged 5, were normal. Skiagrams of the mother and the affected children showed no abnormality in the bones. Unlike Golding-Bird, who held that congenital wry-

neck never affected the left side, Greig had observed twenty-four cases of congenital torticollis in which eight were on the left, fifteen on the right, and one in which both sterno-mastoids were involved. Greig attributes the occurrence of his cases to a maternal source, suggesting that some slight pelvic defect or peculiarity might cause a malposition of the foetus *in utero*.

J. D. ROLLESTON.

**ACUTE THYROIDITIS AS A COMPLICATION OF ACUTE TONSILLITIS.** C. F. THEISEN, *Albany Med. Annals*, 1913, *xxiv*, p. 465.

A RECORD of six cases of acute simple thyroiditis in women, aged from 19 to 25. Five occurred in connection with tonsillitis, and one in the course of pneumonia. In all the gland had been previously healthy. Two of the patients subsequently developed well-marked goitre, and two others typical hyperthyroidism. A review of the literature is given.

J. D. ROLLESTON.

**HEREDITARY OPTIC NEURITIS. Eleven Cases in Three Generations.** A. S. WORTON, *Lancet*, 1913, Oct. 18, p. 1112.

THIS affection, also known as Leber's disease and as hereditary optic atrophy, was first described by Leber in 1871. Both eyes are usually affected. Rapid loss of central vision occurs, usually lasting some considerable time, and followed in a certain proportion of cases by more or less spontaneous recovery of visual function. A few cases go from bad to worse. The condition is essentially one of inheritance, and although males are more liable, transmission usually occurs through unaffected females. The pathology is obscure. The ophthalmoscopic appearances during the attack are those simply of a mild neuritis, hyperæmia of the discs, fluffiness of the disc margins, and slight perivasculitis. The neuritis slowly subsides, and the signs of atrophy supervene.

A chart is here given of an example of this condition. All the eleven affected individuals were males. The age incidence varied from 9 to 32 years. Of the four cases personally examined, two had regained practically normal vision, but leaving some deficiency in the light sense; one case is still under observation, and in one the vision is reduced to hand movements close to the eyes. In all the cases where visual power was completely regained, or been partially recovered, the age was below 20.

A. NINIAN BRUCE.

## PSYCHIATRY.

**GENERAL PARALYSIS IN THE NEGRO.** FRANCIS M. BARNES, (578) *N.Y. Med. Journ.*, 1913, xcvi, Oct. 18, p. 767.

GENERAL paralysis, while rare in the full-blooded negro, is very common in the coloured races where hybridisation has now occurred. It is characterised in them by the greater frequency of the occurrence of hallucinations, the predominance of the demential type of the disease, and the greater frequency of paresis among coloured females than among the whites of the same sex. Statistics are given of 288 cases of paretics out of a total admission of 3,406 cases of mental disease. Of these, 74 were coloured, and 9.2 per cent. were paretics, while the proportion among the whites was 7.4 per cent. 50 per cent. of all the cases were between 30 and 40 years.

A. NINIAN BRUCE.

**SALVARSAN IN GENERAL PARALYSIS OF THE INSANE AND (579) TABES.** M. FITZMAURICE-KELLY, *Journ. of Ment. Sci.*, 1913, July, p. 498.

A DISCUSSION of the results of the treatment by the intravenous injection of salvarsan in eight cases of tabes and four cases of general paralysis. Well marked relief of the lightning pains and of the visceral crises occurred in the tabetic cases, but there was no definite improvement in the general paralytics. One of the latter developed signs of general paralysis after the successful injection of salvarsan for tertiary syphilitic glossitis. The author considers that the drug should only be used for the relief of symptoms, and that there is some risk of acceleration of the disease.

W. D. WILKINS.

**THE INFLUENCE OF TYPHOID FEVER ON EXISTING MENTAL (580) DISEASE.** (Ueber den Einfluss des Abdominaltyphus auf bestehende geistige Erkrankung.) W. H. BECKER, *Allg. Zeitschr. f. Psych.*, 1912, lxix., p. 799.

THE favourable influence of intercurrent typhoid fever upon psychoses has often been observed by psychiatrists, including Kraepelin and Ziehen. Becker, from his experience at the Weilmünster Asylum, finds that this improvement depends on three factors. 1. The character of the psychosis. 2. The age of the patient. 3. The duration of the psychosis before the attack of typhoid. Idiocy, epilepsy, general paralysis, and senile mental disturbance are quite uninfluenced by the disease. Dementia



præcox, on the other hand, is very often improved, so that in some cases the patient may be discharged. The effect of the disease on manic-depressive insanity could not be determined, owing to its circular and periodic character.

Improvement was more frequent in younger patients and in those in whom the psychosis had not been of long duration.

J. D. ROLLESTON.

**THE RELATIONS OF INTERNAL SECRETIONS TO MENTAL (581) CONDITIONS.** L. V. FRANKL HOCHWART, *Amer. Journ. Med. Sc.*, 1913, cxlvi., No. 2, August.

In this article a review is given of the effects of a number of the internal secretions on mental conditions, and how the development of the mind depends on these secretions.

In Basedow's disease the predominance of maniac features is emphasised. The individuals are often excited, though we cannot exactly speak of a psychosis. They are talkative, inclined to witticisms, and are given to sexual excesses.

A case is instanced in which a permanent cure resulted when the Basedow symptoms disappeared.

In myxœdematous patients, on the other hand, the lack of emotion is the striking feature.

In affections of the parathyroid glands tetany is common. Individuals with tetany are excitable, timid, quarrelsome, and inclined to outbreaks of temper.

In strumectomised animals, hallucinations, idiocy, and pathologic motion phenomena occur.

In pituitary body tumours a peculiar indifference, euphoria, and contentment are pronounced. The genital glands, the pineal body, thymus, and suprarenal bodies are also referred to.

D. K. HENDERSON.

**ON THE DEMONSTRATION OF DEFENCE-FERMENTS IN THE (582) BLOOD SERUM OF THE INSANE BY ABDERHALDEN'S DIALYSIS METHOD.** (Ueber den Nachweis von Abwehrfermenten im Blutserum vornemlich Geisteskranker durch das Dialysierverfahren nach Abderhalden.) V. KAFKA (of Hamburg), *Zeitsch. f. d. ges. Neurol. u. Psychiat.*, 1913, xviii.

THE author devotes a short introduction to the technique of the method of Abderhalden for demonstrating the presence in the blood serum of proteolytic ferments developed in reaction to specific proteids introduced into or developed within the system.

This method which Abderhalden developed, with a view to determining the presence of pregnancy by demonstrating a proteolytic ferment specific for placenta, has been extended to a great variety of different conditions.

Kafka gives the result of the investigation of an extensive series, chiefly of cases of mental disorder. His most important conclusions are as follows:—

1. The dialysis method is a simple means of determining certain disorders in brain metabolism and in the activity of the glands of internal secretion.

2. Defence-ferments in reaction to brain are formed if the brain tissue itself is diseased (especially by syphilis), or if its metabolism is permanently or suddenly and severely interfered with. This does not mean that in every disease of the brain defence-ferments can be demonstrated in the blood.

3. Defence-ferments in reaction to the sexual glands are characteristic for dementia præcox; apart from this disorder they seem to be found only in general paralysis or in the epileptic in relation to attacks; idiocy and infantilism of dysgenital origin must be investigated from this point of view.

4. Defence-ferments in reaction to adrenals are occasionally found in dementia præcox; they appear to be of importance in the investigation of idiocy and infantilism of glandular origin. The technique of the preparation of the adrenals requires to be improved.

5. Defence-ferments in reaction to thyroid are found in dementia præcox and also in general paralysis; in epilepsy they seem to be related to the attacks. Disorders of the thyroid require further investigation; some forms of Basedow disease only show a slight tendency to the formation of such defence-ferments.

6. Defence-ferments in reaction to hypophysis were only demonstrated in acromegaly and tumour of the hypophysis.

7. The presence of ferments in reaction to sexual glands seems already to be of diagnostic and prognostic use in the dementia præcox group. Also in the more severe disorders of the glands of internal secretion the ferment investigations have already practical value, although they are subordinate to the clinical examination.

8. The above results encourage therapeutic experiments, especially in the dementia præcox group.

9. In the last-named group the ferment examination enables one to make a provisional sub-group.

10. It is premature at present to discuss the specificity of individual ferments.

C. MACFIE CAMPBELL.

**RESEARCHES ON THE OPSONIC INDEX OF THE BLOOD SERUM  
(583) AND ON THE RESISTANCE OF THE LEUCOCYTES IN  
MENTAL DISEASE.** NINO RAMELLA and GIUSEPPE ZUCCARI,  
*Rassegna di Studi Psichiatrici*, 1913, iii., Sett.-Ott., p. 355.

THE authors have examined the opsonic index for the *Staphylococcus pyogenes aureus*, the *Streptococcus* and the *Bacillus coli*, as well as the resistance of the leucocytes, in 14 epileptics, 12 cases of dementia præcox, and 6 cases of pellagra. They found that the opsonic index was highest in epileptics, being usually above one, and most marked for the staphylococcus. In the dementia præcox and pellagra cases the index was usually below one, and usually lowest of all for the streptococcus. The opsonic index in epileptics did not differ if taken during fits or during the interval between them.

The resistance of the leucocytes is closely related to the opsonic index, being highest amongst epileptics and lowest in the dementia præcox and pellagra cases. A. NINIAN BRUCE.

**SOME SUGGESTIONS RESPECTING THE CARE OF THE FEEBLE-  
(584) MINDED UNDER THE MENTAL DEFICIENCY BILL, 1913.**  
A. R. DOUGLAS, *Journ. of Ment. Sci.*, 1913, July, p. 487.

A CONSIDERATION of the existing machinery for the care of the various classes of defectives included in the provisions of the above Bill. The author urges that the present voluntary institutions for the care and training of the feeble-minded should form the nuclei of the future arrangements, but that idiots, as they require more expensive treatment, should be dealt with separately in mental hospitals. W. D. WILKINS.

**MORAL INSANITY.** ROBERT HUNTER STEEN, *Journ. of Mental Sci.*,  
(585) 1913, July, p. 478.

A PLEA for the more accurate delimitation of a group of moral defectives, characterised by a tendency to crime, the latter being often unaccompanied by any apparent motive, and with little attempt at concealment. The author believes that in these cases the "moral sense centre" is congenitally absent, and considers that they should be dealt with in the provisions of the Mental Deficiency Bill. W. D. WILKINS.

**THE INFLUENCE OF PHYSICAL ILLNESS ON THE MENTAL  
(586) STATE IN INSANITY.** G. E. PEACHELL, *Journ. of Mental Sci.*,  
1913, July, p. 492.

THE author gives the notes of six cases in which the mental state materially improved with the incidence of physical illness, the

latter being sulphonalism in two cases. The mechanism by which this effect is produced is discussed, and suggestions made for its intentional production, either by the empirical inoculation of vaccines, or by the stimulation of leucocytosis.

W. D. WILKINS.

**ON ATTEMPTED SUICIDE, WITH AN ANALYSIS OF 1,000 CON-**  
(587) **SECUTIVE CASES.** W. NORWOOD EAST, *Journ. of Ment. Sci.*,  
1913, p. 428.

AN exhaustive analysis of the cases of attempted suicide received into Brixton Prison in two and a half years, with valuable statistical tables. After noting the benefit derived in many cases from short terms of imprisonment, the author points out the parallel between the number of would-be suicides and the amount of unemployment. There is an interesting seasonal variation, at present only tentatively explained, suicidal attempts being more frequent in the summer.

The tendency to suicide increases as age advances, but this would have been more clearly brought out if the cases had been correlated with the number of persons living at each age.

Full tables are given of the methods employed, and interesting differences are noted between those employed in actual suicides and in successful attempts. Hanging heads the list of unsuccessful attempts with 27·61 per cent., whereas only 8·40 per cent. of the unsuccessful attempts were of this nature, an apparent proof of the ease with which death can be produced in this way, and probably of the suddenness with which unconsciousness ensues. Poison, on the other hand, accounts for 34·00 per cent. of unsuccessful attempts, whilst only 16·00 per cent. of the deaths were due to this cause, an indication probably that the public commonly under-estimates the lethal dose. This does not apply to coal gas, to which the largest number of deaths by poison were due, viz., 22 per cent., whilst only 6·00 per cent. of the unsuccessful attempts were under this heading.

The author attaches very great importance to the influence of alcohol in the production of suicide, and ascribes 393 of the 1,000 cases to this cause—a startling proportion. Many of these cases are true examples of alcoholic impulse with amnesia. Insanity was present in 123 cases, chiefly melancholics, but other 82 cases showed weakmindedness, neurasthenia, or epilepsy.

It need hardly be said that the author considers suicide is no sign of insanity.

W. D. WILKINS.

## TREATMENT.

**EFFECTS OF CONTINUOUS ADMINISTRATION OF EXTRACT OF**  
 (588) **THE PITUITARY GLAND.** JOHN H. MUSSER, *Amer. Journ.*  
*Med. Sc.*, 1913, cxlvi., No. 2, August.

THE preparation employed was the extract of the whole gland made up in 0.2 g. tablets containing 0.065 g. of the dried gland, equivalent to 0.26 g. of the fresh gland. The dosage at first was two of these tablets twice a day, but no effect was noted until the dose was increased to one tablet four times a day. All patients took the tablets for at least a month, unless stopped because of untoward effects.

Of eighteen individuals, seventeen showed a rise in systolic blood pressure, the greatest rise being 27 mm. of mercury. A corresponding rise in diastolic pressure occurred. An increase in pulse rate was generally observed, though in two individuals the rate was decidedly decreased.

The conclusion is that the gland exerts a distinct pressor effect upon the peripheral vascular apparatus, which persists for an appreciable time after discontinuation of the drug.

D. K. HENDERSON.

## Reviews.

**THE PITUITARY BODY AND ITS DISORDERS.** *Clinical states*  
 (589) **produced by disorders of the hypophysis cerebri.** HARVEY  
 CUSHING. Pp. x. and 341 ; 319 illustrations. J. B. Lippincott Co.,  
 Philadelphia and London. Pr. 18s. net.

No one interested in this subject can afford to neglect this book, which presents to the reader in a clear and concise manner the most important points in our present knowledge of pituitary disease. There is every reason to believe, as Prof. Cushing states in his preface, that cases of clinically recognisable pituitary disease are at least as common as are cases of clinically recognisable thyroid disease, and we find here an account of the pituitary gland from the experimental, clinical, and surgical points of view.

The book is divided into three parts. The first deals very briefly with the anatomy, physiology, pathology, and chemistry of the pituitary gland. The second, and largest, part deals with the clinical manifestations of disordered function, and a classification or grouping of cases is put forward as a provisional basis for clinical use.

It is pointed out that a time is unquestionably approaching

when the classification here employed will no longer be necessary, but at the present stage of our knowledge it is the most practical. Five types of pituitary disorder are here recognised: (1) Cases in which both neighbourhood and glandular symptoms are outspoken; of this there are three types, (*a*) hyperpituitarism, (*b*) hypopituitarism, and (*c*) dyspituitarism; (2) cases with pronounced neighbourhood but inconspicuous glandular symptoms; (3) cases with pronounced glandular manifestations but inconspicuous neighbourhood symptoms, with (*a*) past hyperpituitarism, or (*b*) hypopituitarism as the striking feature; (4) cases of hypophyseal disorder from remote intracranial lesions with hydrocephalus, with (*a*) hyperpituitarism, or with (*b*) hypopituitarism; and lastly (5) cases showing a polyglandular syndrome. Part III. deals with the incidence, symptomatology, and treatment of such disorders.

The book itself has been particularly well reproduced. The type is good and the illustrations remarkably clear. The records of the cases are most valuable, and there is a good bibliography and index. We have perfect confidence in recommending this book to all those interested in this subject.

**THE PSYCHONEUROSES AND THEIR TREATMENT BY**  
(590) **PSYCHOTHERAPY.** Prof. J. DEJERINE and Dr E. GAUCKLER.  
Authorised translation by SMITH ELY JELLIFFE. J. B. Lippincott Co.,  
Philadelphia and London. Pr. 18s. net.

THIS book, the French edition of which we have already reviewed (*v. Review*, 1912, x., p. 503), has been most successfully translated into English, in fact it is one of the best translations we know. The translator points out how he had been struck by the immense number of minor psychic disturbances which render numerous individuals unhappy, discontented, ill, and unable to hold their own in their milieu, even making confirmed invalids of many. The appearance of this volume, at a time when psychic problems are beginning to receive such wide recognition, is most opportune, and places in the hands of those who do not read French easily, one of the most valuable of recent works on this subject. The large number of cases recorded here form most instructive and interesting reading, and it will be easily seen how many patients may be treated and cured without a resort to the more detailed analyses elaborated to meet more complex situations. The emphasis laid upon the minor emotional factors in all the disorders under discussion represent an important side which has been somewhat neglected by former authors. Functional nervous disorders are here treated by a master hand, and we are certain that no one who may take up this book can fail to benefit greatly from its perusal.

## The International League against Epilepsy.

THE International Committees of the League met in London on August 13th, at the conclusion of the International Medical Congress. Dr Aldren Turner (London) presided. There were also present:—Kocher (Berne), Anton (Halle), Donath (Buda-Pesth), Moreira (Brazil), Krohn (Norway), Muskens (Holland), M'Dougall (Manchester), Collins (London), and Crocket (Glasgow).

After a short opening address by the Chairman, communications were read by Prof. Anton, Dr M'Dougall, and Dr Collins. These will appear in full in the next number of *Epilepsia*.

At the conclusion of the meeting visits were paid to the London County Council Epileptic Colony at Ewell, and to the David Lewis Epileptic Colony at Alderly Lodge.

The next meeting of the League will be held in Berne, in August 1914, on the occasion of the next International Congress of Neurology and Psychiatry.

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### BOOKS AND PAMPHLETS RECEIVED.

"*Alienist and Neurologist*," 1913, xxxiv., Aug., No. 3.

Flexner, Simon, and Noguchi, Hideyo. "Experiments on the cultivation of the micro-organism causing epidemic poliomyelitis" (*Journ. Exp. Med.*, 1913, xviii.).

Gresswell, Albert and George. "The Vital Balance," pp. 136. Wm. Rider & Son, London. Pr. 2s. net.

Lugaro, Ernesto. "Modern Problems in Psychiatry," translated by David Orr and R. G. Rows; with a foreword by Sir T. S. Clouston. Sherratt & Hughes, London, 1913. Pr. 7s. 6d. net.

"*Maladies des Meningen*." By Hutinel, Klippel, Claude, Voisin, and Levy-Valensi, pp. 383, with 49 figs. J. Baillière et Fils, Paris, 1912. Pr. Fr. 8.

Noguchi, H. "Additional studies on the presence of *Spirochaeta pallida* in general paralysis and tabes dorsalis" (*Journ. Cut. Dis.*, 1913, August).

Noguchi, H. "The transmission of *Treponema pallidum* from the brains of paretics to the rabbit" (*Journ. Amer. Med. Assoc.*, 1913, lxi.).

Oppenheim, H. "Weitere Beiträge zur Diagnose und Differentialdiagnose des Tumor medullae spinalis" (*Monatsschr. f. Psychiat. u. Neurol.*, 1913, xxxiii.).

Pick, A. "Über den Nachweis latenter aphasischer Erscheinungen durch Ermüdung und die Möglichkeit seiner diagnostischen Verwertung" (*Prager Mediz. Wchnschr.*, 1913, xxxviii.).

Salmon, A. "Sul significato patologico della reazione miastenica nei casi di nevrosi traumatica" (*Riv. Crit. di Clin. Med.*, 1913, xiv.).

Sommer, R. "Öffentliche Ruhehallen" (*Sammlung Hoche*, 1913, x.).

Tuckey, C. Lloyd. "Treatment by Hypnotism and Suggestion": Sixth edition, revised and enlarged, pp. xxviii. + 431; 5 figs. in text. Demy 8vo. Baillière, Tindall & Cox, London. Pr. 10s. 6d. net.

"*The Training School*," 1913, x., October.

# Review of Neurology and Psychiatry

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## Original Articles

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### THE DIRECT VENTRO-LATERAL PYRAMIDAL TRACT.

By WILLIAM G. SPILLER, M.D.,  
Professor of Neuropathology in the University of Pennsylvania.  
(With Plate 32.)

THIS tract was first described by me at a meeting of the Philadelphia Neurological Society, 28th November 1898. The case in which it was discovered was one of hæmorrhage in the external capsule and lenticular nucleus. The degeneration of the fibres evidently had its origin in this lesion. A little below the exit of the fifth nerve from the pons a band of fibres became separated from the outermost and lateral portion of the pyramidal tract. Lower in the pons this band of fibres passed abruptly backward and entered the trapezoid body. It took a position at the junction of the medulla oblongata and pons lateral to the uppermost portion of the inferior olive. As the olive increased in size the bundle passed backward, and where the olive had its largest width the bundle took a position on the posterior and lateral side of the olive. The bundle was traced below the motor decussation, and remained uncrossed throughout its entire length. It was traced as far as the first cervical segment, but could not be traced further as the spinal cord was not obtained.

The literature on this tract to the year 1913 is given in the work on the anatomy of the central nervous system by Ziehen,<sup>1</sup>

Spiller, *Journal of Nervous and Mental Disease*, 1899, p. 178; *Brain*, 1899, p. 563; *Neurologisches Centralblatt*, 1902, p. 534.

Ziehen, "Anatomie des Centralnervensystems," II. Abteilung, Teil I. (Bardleben's "Handbuch der Anatomie des Menschen"), 1913, p. 194.



and it would be useless to repeat it. The tract has been observed by numerous investigators. It arises from the pyramidal tract in the pons or medulla oblongata, and when arising in the latter place it is described as passing backward with the anterior external arcuate fibres, or a little interior to these, on the periphery of the medulla oblongata. After reaching the region of Gowers' tract the fibres of the direct ventro-lateral pyramidal tract bend again downward, and pass in this region to the ventral periphery of the lateral column into the thoracic region, or in one case (Bumke) to the lumbar swelling. Ziehen speaks of the tract as the aberrant ventro-lateral pyramidal tract.

In a case I have recently studied the separation of the direct ventro-lateral pyramidal tract occurred in the medulla oblongata, but in a different manner from that described in Ziehen's summary of the literature. The tract did not pass backward with or interior to the anterior external arcuate fibres, but maintained throughout a longitudinal course. The case was one of hæmorrhagic cyst in the right lenticular nucleus and external capsule. The pyramidal tract fibres extended around the lower olive in its upper part, and spread out in a triangular shape immediately posterior to the olive at the periphery of the medulla oblongata. They were all cut transversely in a transverse section of the medulla oblongata, and no rows of black dots were found in the anterior external arcuate fibres indicative of a longitudinal course. The outer portion of the anterior pyramid clearly was interrupted by the development of the olive and the anterior external arcuate fibres. The pyramidal fibres which, in the upper part of the medulla oblongata, extended around the olive were gradually completely divided by the olive and anterior external arcuate fibres, so that a triangular zone posterior to the olive was formed without connection with the anterior pyramid.

The direct ventro-lateral pyramidal tract was spread more along the periphery of the cord at the sixth cervical segment than at the seventh cervical segment; at the latter it was very distinct and more triangular in shape. The direct pyramidal tract on the same side of the cord was much degenerated, but was not continuous with the direct ventro-lateral tract. The crossed pyramidal tract of the opposite side was much degenerated, but there was little or no degeneration in the crossed pyramidal tract of the same side. The direct ventro-lateral tract was still distinct

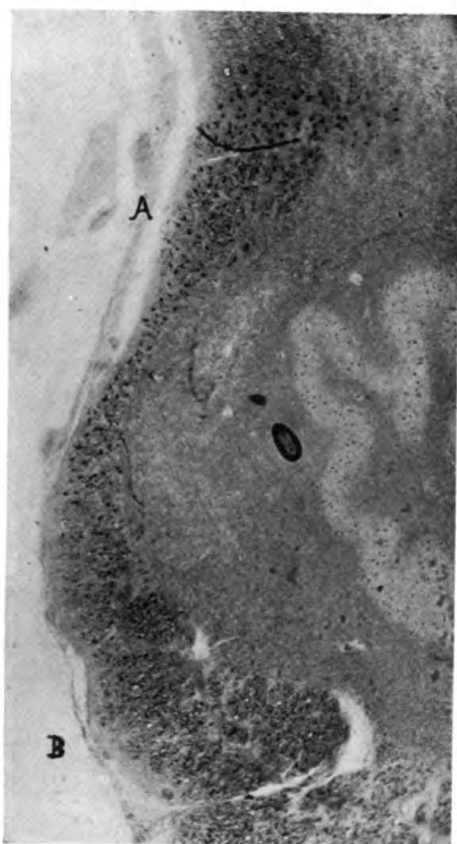


FIG. 1.

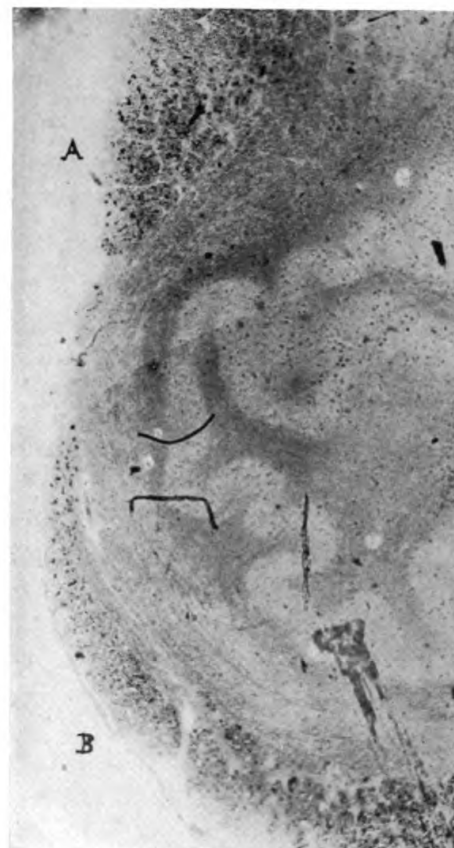


FIG. 2.



FIG. 3.

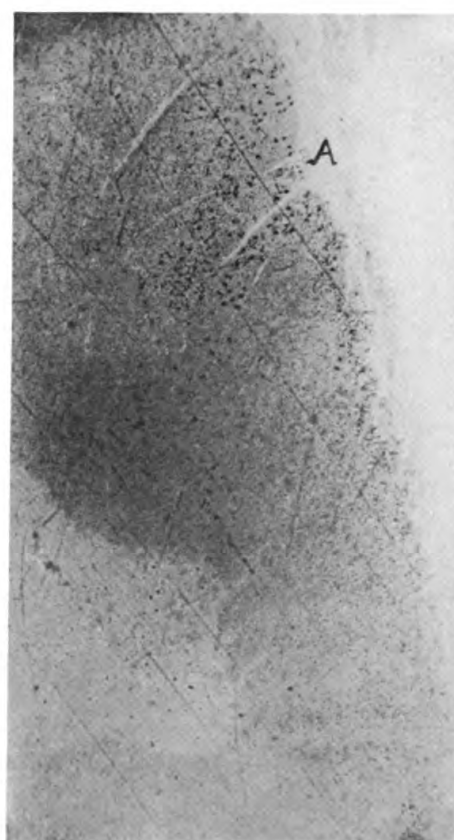
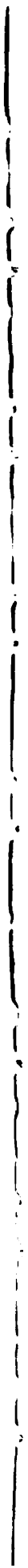


FIG. 4.



at the eighth cervical segment, and of much the same form as at the seventh cervical segment, but was of smaller area. It was not traced below the first thoracic segment.

#### DESCRIPTION OF FIGURES.

Fig. 1. Showing the fibres of the anterior pyramid, B, extending well around the olive, and united with the direct ventro-lateral pyramidal tract, A.

Fig. 2. The olive and anterior external arcuate fibres are beginning to separate the direct ventro-lateral pyramidal tract, A, from the anterior pyramid, B.

Fig. 3. The separation of the direct ventro-lateral pyramidal tract, A, from the anterior pyramid, B is complete.

Fig. 4. Showing the position of the direct ventro-lateral pyramidal tract, A, in the spinal cord. This section has been reversed in photographing it.

I am indebted to Dr A. J. Smith for the photographs. They have been slightly retouched.

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## Abstracts.

### ANATOMY.

**THE NERVE SUPPLY TO THE PITUITARY BODY.** WALTER E. (591) DANDY, *Amer. Journ. Anat.*, 1913, xv., Nov., p. 333.

THE nerve supply to the pituitary body is from the carotid plexus of the sympathetic system. Numerous branches radiate to the stalk along the hypophyseal vessels, and are immediately lost to view in the substance of the anterior lobe. The posterior lobe nerve supply is very scant, in marked contrast to the extensive innervation of the anterior lobe. The pars intermedia receives its nerves from the stalk. There is connection between the carotid sympathetic system and the oculomotor and optic nerves. The absolute differentiation between secretory and vasomotor nerves is, of course, a matter of much dispute and is impossible. The impression, however, from the character and course of the nerve fibres, their greatly increased number in the region of the hypophysis, the differences between the supply of the anterior and posterior lobes, the connections established with the other cranial nerves, leads us to regard them as secretory, in contradistinction to vasomotor, the existence of which in the cranial chamber has not been observed. The *intra-vitam* methylene blue method was used to stain the nerves.

A. NINIAN BRUCE.

## PSYCHOLOGY.

**THE CARDIO-CERVICAL CHROMAFFINE SYSTEM IN REPTILES**(592) **(Le système chromaffin cardiaco-cervical chez les sauriens.)** G.TRINCI, *Arch. Ital. de Biol.*, 1913, lix., Sept. 15, p. 431.

TRINCI finds the following chromaffine cell-groups in reptiles:— (1) In the interior and along the walls of the large arteries, from the cardiac region to the cervical region at the level of the thymus; (2) a certain number of cells occur constantly in the cardiac arterial trunk: these he calls the cardiac paraganglion; (3) others, also constant, near the area of bifurcation of the carotid. "the carotid paraganglion," to be regarded as homologous with the mammalian carotid body; (4) others, serially interposed between the former paraganglia, in direct or indirect relation with the sympathetic and the large arteries of this region. Trinci states that he demonstrated (1907) the existence of a cardiac paraganglion in mammals, confirmed for man by Busacchi (1912). Trinci believes that there are several varieties of chromaffine cells; thus, in some the chrome reaction is intense, in others it may be absent. He combats the hypothesis of Fedele (1910) that these cardiac chromaffine cells of reptiles are rather to be interpreted as nerve ganglia, or at least as cells intermediate between chromaffine and nerve cells.

LEONARD J. KIDD.

## PATHOLOGY.

**THE PRESENCE OF NEGRI'S BODIES IN THE NERVE GANGLIA**(593) **OF THE SALIVARY GLANDS OF RABID ANIMALS.** (Sur**l'existence des corpuscles de Negri dans les ganglions nerveux des glandes salivaires chez les animaux rabiques.)** Y.MANOUELIAN, *Compt. Rend. de l'Acad. des Sciences*, clvii., No. 19, 1913, Nov. 10, p. 866.

FROM an examination of the parotid and submaxillary glands of twenty rabid dogs, the author finds that Negri's bodies are almost constantly present in the cytoplasm of the nerve cells of the ganglia which are constantly found in the interstitial tissue of these glands; but there are no Negri's bodies in the gland parenchyma, acini cells, or excretory ducts. He points out that unskilled observers may mistake leucocyte corpuscles and debris of glandular cells for Negri's bodies. The intra-glandular ganglia are partly microscopic, partly visible to naked eye in coloured sections: all these ganglia are formed of cells of sympathetic type. Negri's bodies are also found in the sympathetic ganglia and the cerebro-spinal ganglia. Further, the author finds that in the nerve trunks accompanying the vessels of the salivary glands there exist small masses of nerve cells, and even sometimes

a single nerve cell: Negri's bodies are found in the cytoplasm of these cells also.

LEONARD J. KIDD.

**THE WEIGHT OF THE ADRENALS IN THE INSANE.** (*Recherches* (594) *pondérales sur les capsules surrénales chez les aliénés.*) C. PARHON and G. ZUGRAVU, *Arch. Internat. de Neurol.*, 1913, **xxxv**, Nov., p. 273.

PARHON showed previously that the average weight of the thyroid body is greatest in the affective psychoses—mania, melancholia, manic-depressive—and least in epilepsy. The average weight of the two adrenals in various psychoses the authors give as follows:—it is greatest in G.P.I., 16 grm. 30; then follow epilepsy, 15.70; dementia præcox, 15.50; senile dementia, 14.44; alcoholism, 14.30; pellagra, 13.83; mental confusion, 13.71; imbecility, 12.22; mental debility, 10 grm.; and idiocy, 9.87. The low weight in idiocy is partly explained by the early age of the patients. Usually the adrenals are less heavy in the female sex. Testut gives 6 to 7 grm. as the average weight of each adrenal. Claude and Schmieregeld found in ten female epileptics an average weight of 20 grm. .20 for the two adrenals, *i.e.*, higher than normal. A. Marie and Dide also found a high average for G.P.I. and epilepsy. In connection with the low adrenal weight in pellagra, Parhon has often seen an appearance of adrenal hypofunction: this is confirmed by Garbini, who advises adrenal opotherapy in adynamic confusion-psychoses. In G.P.I. Laignel-Lavastine notes a great abundance of spongiocytes in the adrenals; Parhon has often seen this. Sometimes, however, there is in G.P.I. a diminution of the lipoids of the adrenal cortex. Stern connects the strong musculature and hypertrichosis of G.P.I. with hyperadrenalism: he thinks that the latter, with hyperpituitarism and hypofunction of genitals and parathyroids, and thyroidal instability, predisposes to G.P.I. Mention is made of Apert's hirsutism, an adrenal syndrome. Parhon has seen an adenomatous nodule in an adrenal of a fat general paralytic; and he suggests that there may be an adrenal element in the obesity of general paralytics lately described by himself with Obregia and Urechia. The paper has a table of adrenal weights in the psychoses.

LEONARD J. KIDD.

## CLINICAL NEUROLOGY.

**NOTE ON CONTRALATERAL OPPENHEIM AND GORDON** (595) **REFLEXES, WITH OBSERVATIONS IN TWO CASES.** A. MYERSON, *Journ. Nerv. and Ment. Dis.*, 1913, **xl**, Sept., p. 574.

A COLOURED man, 50 years, in a delirious mental condition, had retention of urine, paralysis of both legs, and jerky twitchings of

all four extremities. The tendon reflexes were more exaggerated on the right side than on the left, and ankle clonus was present on the right side, but there was no sign of Babinski on either side.

Stimulation of the right tibia (Oppenheim's method) produced homolateral and contralateral extension of the great toe; stimulation of the left tibia produced only homolateral extension of the great toe. The same results were obtained by stimulation of the tendo Achillis on either side.

*Case No. 2.*—Patient, male, 62 years, who showed symptoms pointing unmistakably to cerebral arterial lesions, showed on the right side homolateral and contralateral Babinski, Oppenheim and Gordon signs, and on the left side homolateral Oppenheim and Gordon signs, but no sign of Babinski. D. K. HENDERSON.

**REFLEX FREQUENCY AND ITS CLINICAL VALUE.** WALTER B. (596) SWIFT, *Journ. of Nerv. and Ment. Dis.*, 1913, xl., Sept., p. 585.

THE author claims that this is the first scientific investigation of relative reflex frequency. D. K. HENDERSON.

**CERVICAL ZOSTER AND PARALYSIS.** (*Zona cervical et paralysie.*) LACROIX, *Journ. de méd. de Bordeaux*, 1913, lxxxiv., p. 664.

A WOMAN, aged 64, developed left facial paralysis of the peripheral type a few days after the eruption of cervical zoster on the same side. The existence of cerebro-spinal lymphocytosis suggested that a chronic meningitis involved both the posterior root ganglia and the facial nerve in its intra-meningeal course. The causal infection was not determined. There was no history of syphilis, but Wassermann's reaction had not been performed. On the other hand, a history of repeated attacks of bronchitis suggested a tuberculous origin for the meningitis. J. D. ROLLESTON.

**IONIC MEDICATION IN HERPES ZOSTER.** ANGUS MACNAB, (598) *Lancet*, 1913, March 22, p. 821.

FROM the ophthalmic point of view herpes zoster can be divided into two classes: (a) those in which there is no affection of the cornea and iris, and (b) those in which there is iritis, and generally an affection of the cornea. A case of each is described.

In the first case the whole of the forehead, the side of the nose, and the upper lip on the left side were all affected. The whole of the conjunctiva was congested. The surface of the cornea was clear, and there were no signs of involvement of the iris. An electrode of about 15 sq. in. was applied to the affected

area over three thicknesses of lint soaked in a solution of quinine sulphate. A current of 15-20 milliampères was passed for twenty minutes. Three days later the skin condition was greatly improved, and there was a slight improvement in the condition of the conjunctiva and the cornea. An electrode was prepared to fit the conjunctiva, and after instilling cocaine this was applied for four minutes, the forehead was again treated for fifteen minutes. There was a severe reaction next day, which soon passed off, and later, beyond a slight tendency to watering in the eye affected, recovery appeared to be perfect.

The second case was seen fourteen weeks after the onset of the attack. On the cornea were some four or five spots, the remains of vesicles which apparently from the density of the nebulæ had pustulated. The pupil was semi-dilated, and reacted very badly to light, and some exudate was present on the surface of the iris and the anterior capsule of the lens. An electrode of 6 sq. in. was prepared, and a current of 4 milliampères passed through a solution of quinine for twenty minutes. A fortnight later the condition was much better, and a second application was made through an electrode of 3 sq. in. of 5 milliampères for fifteen minutes. A fortnight later the eye appeared to be completely recovered.

A. NINIAN BRUCE.

**CHRONIC RHEUMATIC PERIARTHRITIS FOLLOWING ZOSTER,  
(599) AND RESTRICTED TO THE AREA OF THE ERUPTION.**

(Périarthrite rhumatismale chronique consécutive à un zona et localisée dans le territoire de l'éruption.) G. GUILLAIN and D. ROUTIER, *Bull. et mém. Soc. méd. Hôp. de Paris*, 1913, xxxvi., p. 437.

A DIABETIC woman, aged 70, developed zoster of the left upper limb. The vesicles covered the back of her hand and interdigital clefts, and spread upwards on the dorsal aspect of the forearm to the elbow. Pain in the finger-joints developed simultaneously with the eruption, and was followed by persistent stiffness. For two years there had been a very definite rheumatic periarthrititis, which was strictly limited to the left hand. X-rays showed an absence of bone lesions.

J. D. ROLLESTON.

**THE TECHNIQUE OF EXCISION OF CERVICAL RIBS. A. S.  
(600) BLUNDELL BANKART, *Lancet*, 1913, clxxxiv., April 5, p. 962.**

THE author recommends an incision about four inches long, parallel to and about an inch from the spinous processes, with its centre



opposite the seventh cervical vertebra. The trapezius is divided, and the cervical rib at its origin from the seventh cervical vertebra located. The rib is now divided close to the vertebra, and, being then *movable*, can be dissected out from the soft parts with the greatest ease.

The objection to the anterior and lateral operations is that the rib is immovably fixed behind up to the very last stage of the dissection, and thus all the soft parts have to be separated and drawn away from the rib before it can be resected. This manipulation and retraction of important parts are responsible for nearly all of the unfavourable sequelæ which may follow these operations.

A case is described of a woman, aged 33, who had a cervical rib. The anterior operation seems to have resulted only in the removal of the tip of the rib and aggravated the symptoms. The posterior operation, however, resulted in a complete cure.

A. NINIAN BRUCE.

**BLINDNESS AND TABES: AN INTRODUCTION TO A NEW  
(601) METHOD OF CURING ATAXIA.** W. J. M. A. MALONEY,  
*Journ. of Nerv. and Ment. Dis.*, 1913, xl., Sept., p. 553.

IN this paper the literature is reviewed to ascertain, if possible, whether or not the presence of optic atrophy or blindness exercise any effect whatever upon the tabetic process in the spinal cord, or upon the spinal symptoms.

Five incontrovertible cases, three of Schupfer's, one of Leri's, and one of Abrahamson's, have been culled from the literature, which seem to prove that ataxia, occurring at or subsequent to the onset of blindness, may be improved. The author's main conclusion, however, is: Neither the occurrence of optic atrophy nor of blindness retards or influences the evolution of the structural changes which accompany the tabetic process in the spinal cord and elsewhere.

The absence of spinal implication in primary tabetic optic atrophy is due to the accident of the localisation of the morbid process, and not to any inhibitory influence arising from that localisation.

The method of enhancing sensory perception in the cure of ataxia has been used with success by the author. Blindfolded tabetics can quickly be taught to appreciate their surviving postural and muscular sense impressions to such a degree that hopeless bedridden ataxics quickly learn to walk again.

D. K. HENDERSON.

**A CASE OF MULTIPLE NEUROFIBROMATOSIS OF THE SKIN.**

(602) (*Een Geval van multiple neurofibromatosis der Huid.*) P. H. SCHOONHEID, *Nederland. Tijdschr. v. Geneesk.*, 1913, ii., p. 1639.

A TYPICAL case in a woman, aged 34, of nervous disposition, in whom the lesions had first appeared at 13 with the onset of puberty. Family history negative. Injection of cacodylic acid, ovarian extract, and Fowler's solution were all ineffectual. A review of the literature is given including the case reported by the abstracter and MacNaughtan (*v. Review*, 1912, x., p. 1).

J. D. ROLLESTON.

**OPTIC NEURITIS IN NEUROFIBROMATOSIS. (Neuritis optici bei**

(603) *Neurofibromatosis.*) F. PINCUS, *Med. Klinik*, 1913, ix., p. 1158.

A CASE of bilateral optic neuritis in a man, aged 41, the subject of von Recklinghausen's disease. There were no other signs of cerebral tumour, so that Pincus is inclined to regard the optic nerves as affected by neurofibromata.

J. D. ROLLESTON.

**PSYCHICAL DISTURBANCES IN THE COURSE OF VON RECK-**

(604) **LINGHAUSEN'S DISEASE. A CUTANEOUS GASTRIC AND PSYCHICAL COMPLEX.** (*Über psychische Störungen im Verlaufe der Recklinghausen'schen Krankheit. Kutanes, gastrisches und psychisches Symptomenbild.*) L. GATTI, *Neurol. Centralbl.*, 1913, xxxii., p. 1027.

MAN, aged 20. The remarkable feature of the case was that the neuro-fibromatosis was much less marked than usual. The gastric symptoms on the other hand were prominent, viz., dyspepsia, absence of free HCl, presence of lactic acid, and the existence of an abdominal tumour suggestive of a fibroma in the stomach wall. The psychical symptoms were apathy and depression, and complete sexual frigidity. Gatti does not know of any case of neuromata or neurofibromata in the stomach. (He has overlooked the case recently described by Leriche in which pyloric stenosis was caused by neurofibromatosis (*v. Review*, 1912, x., p. 33).—J. D. R.)

J. D. ROLLESTON.

**ON THE PATHOGENY OF POST-DIPHTHERITIC PARALYSIS OF**

(605) **ACCOMMODATION.** (*Zur Pathogenese der post-diphtheritischen Akkommodationslähmung.*) S. AUERBACH, *Deut. Ztschr. f. Nervenheilk.*, 1913, xlix., p. 94.

AMONG 26 cases of post-diphtheritic accommodation which were seen at an eye department during a period of fourteen years, there

were 22 children aged from 6 to 14 years, 20 of whom were hypermetropes and 2 emmetropes, and 4 adults aged from 18 to 22—all hypermetropes.

Auerbach concludes that post-diphtheritic paralysis of accommodation is principally due to the physiological weakness of the ciliary muscle peculiar to childhood. In addition to this, in almost every case there is a physical factor, viz., hypermetropia. The latter is always responsible for the isolated cases of paralysis of accommodation which occur in adults, whether due to diphtheria or to other causes. The practical outcome of this theory is that hypermetropes should be forbidden reading or fine sewing in convalescence from diphtheria (i.e., for about eight weeks).

J. D. ROLLESTON.

**AFFECTION OF CONUS MEDULLARIS FOLLOWING RACHISTOVAINISATION.** (606) **TOVAINISATION.** (*Affezione del cono midollare in seguito a rachistovainizzazione.*) E. AGUGLIA, *Riv. ital. di Neuropat., Psychiat. ed Elettroter.*, 1913, vi., p. 389.

A WOMAN, aged 40, suffering from carcinoma of the cervix, developed the following symptoms indicating injury to the conus medullaris directly after rachistovainisation, which were still present three months after the operation. Complete paralysis of bladder and rectum; complete anæsthesia of the rectal, urethral, and vaginal mucosæ; loss of cutaneous reflexes of the sexual organs, and of the visceral and rectal reflexes; total absence of the various forms of sensibility in the clitoris, vulva, perineal and perianal regions; "riding-breeches" anæsthesia; loss of the tendo Achillis reflex on both sides, and numbness of the toes of the right foot, especially of the little toe (*cf. Review*, 1912, x., p. 381).

J. D. ROLLESTON.

**ON A CASE OF POTTS DISEASE.** (*A proposito di un caso di morbo di Pott.*) G. BOLZANI, *Riv. ital. di Neurop., Psychiat. ed Elettroter.*, 1913, vi., p. 345.

THE patient was a man, aged 28, who had had two attacks of Pott's disease. The first, which occurred at 14, involved the seventh cervical and first three dorsal vertebræ. He gradually recovered, though cypho-scoliosis and atrophy of the small muscles of the hands persisted. Nine years later he developed weakness of the lower limbs, with atrophy of the muscles of the thigh and leg, and cramps and twitches in the leg. No painful spot was found on examination of the vertebral column, but the X-rays showed disease of the last dorsal vertebra. J. D. ROLLESTON.

**ON MENINGISM IN INFECTIOUS DISEASES.** (Ueber Meningismus (608) bei Infektionskrankheiten.) KIRCHHEIM and SCHRÖDER, *Deut. Arch. f. klin. Med.*, 1912, ciii, p. 218.

KIRCHHEIM and Schröder investigated the question as to whether meningism really did exist without any microscopical changes. They apply the term "meningism" to cases with well-marked meningeal symptoms, but with a clear cerebro-spinal fluid without increase of albumin or cell contents. In most of these cases the tension was increased, but in many it was normal. Bacteriological examination was negative in all.

Eight illustrative cases are recorded. The first three cases of scarlet fever in children, aged 2, 3, and 6 years respectively, were examples of clinical meningism, with positive evidence of meningitis microscopically. The remaining five—cases of pneumonia in a woman aged 42, and in a boy aged 5, and three cases of scarlet fever in children aged 2, 6, and 7 respectively—were examples of meningism in which the macroscopical and histological findings were negative.

The writers attach special importance to the action of the toxins, and hold that slight anatomical changes sometimes met with in meningism are not enough to produce the meningeal symptoms. They do not agree with Schottmüller (*v. Review*, 1910, viii, p. 703), who holds that there is a gradual transition from meningism to meningitis properly so-called. If this view were correct, one would expect to find clinically spinal hypertension and anatomically hyperæmia and œdema of the meninges and brain in every case of meningism, or as Schottmüller calls it, "Meningitis disseminata acuta septica seu infectiosa." Though these phenomena are present in most cases, they do not occur in all.

J. D. ROLLESTON.

**TUBERCULOUS MENINGITIS (BOVINE INFECTION) IN AN-**  
(609) **INFANT AGED 12 WEEKS.** GEO. A. ALLAN, *Lancet*, 1913, clxxxv., Nov. 29, p. 1535.

A CHILD, healthy at birth, appeared to thrive for about six weeks, after which he made no further progress. Until this time he had been entirely breast-fed, and now he was also given two feeds daily of diluted cow's milk. When he was eight weeks old, a cough developed. The cow's milk was stopped after a fortnight as the mother had plenty of milk. When he was eleven weeks old his condition began to cause serious concern, he was pale, irritable, fed with difficulty, breathing irregularly, convulsions, squint occasionally present, head retracted, and ultimately became comatose and died.

The spleen showed small tubercles. On culture it was found that the bacillus was of the bovine type. The mother, father, and only other child were all healthy. The infant was really breast-fed. Only after it had begun to show signs of malnutrition was that augmented by cow's milk and then only for a fortnight. There seems no sufficient grounds for supposing the milk was the direct source of infection. An adopted boy, however, had to have tuberculous glands from his neck removed shortly after the death of the child, and the author thinks this must be a case of direct bovine infection through the oral cavity. A. NINIAN BRUCE.

**FUSIFORM BACILLI ASSOCIATED WITH VARIOUS PATHOLOGICAL PROCESSES.** G. F. DICK, *Jour. Inf. Dis.*, 1913, xii., p. 191.

FUSIFORM bacilli were found in three cases of meningitis. In one of them the infection probably arose from the middle ear, which is connected with the naso-pharynx, in which these bacilli are usually found. In the other two cases the infection probably followed chronic bronchitis, as in cases reported by Ghon and Mucha, and by Kaspar and Kern. The failure of attempts to demonstrate the pathogenicity of the bacilli in animals suggests that they were present only as secondary invaders, as other organisms were present in every case. J. D. ROLLESTON.

**THE BLOOD AND THE CEREBRO-SPINAL FLUID IN MUMPS.** (611) A. FEILING, *Lancet*, 1913, ii., p. 71.

FROM examination of the blood of forty cases of mumps in patients aged from 2 to 38 years, Feiling found (1) that there was a slight increase in the total number of leucocytes; (2) that there was an absolute and relative lymphocytosis; (3) that this lymphocytosis was present on the first day of disease, and persisted for at least fourteen days. He records a case of meningitis in a boy aged 5½ years, which occurred in the acute stage of mumps. The cerebro-spinal fluid was colourless, slightly turbid, and under slightly increased tension. Differential count: lymphocytes, 96 per cent.; polymorphs, 2 per cent.; endothelial cells, 2 per cent. Bacteriological examination negative. A second puncture, two days after the first, showed only twenty cells per cubic millimetre, of which 90 per cent. were lymphocytes. Complete recovery took place. Feiling concludes from this and other cases on record: (1) that cerebro-spinal lymphocytosis occurs in mumps both when complicated by meningitis or lesions of the

cranial nerves, and also when there are no clear clinical symptoms of organic disease of the nervous system. J. D. ROLLESTON.

**A STUDY OF THE CEREBRO-SPINAL FLUID IN ACUTE (612) POLIOMYELITIS.** FRANCIS R. FRASER, *Journ. Exp. Med.*, 1913, xviii, p. 241.

THE spinal fluid in the cases of acute epidemic poliomyelitis examined was usually clear, colourless, and did not appear to be under any great increase of pressure. It showed changes in the number of cells present, or in the globulin content, or in both, in the majority of cases examined on the first few days after onset of symptoms. The number of cells was usually highest during the first week, in one case as much as 1,221 per cubic millimetre. The globulin reaction was usually most marked during the third week. The number of cells diminished rapidly, and was above normal in only 32 per cent. of the cases in the third week. The increase in the globulin reaction persisted to the fourth week, and might be present for a considerably longer period. The cell increase was due almost invariably to mononuclear cells of various types. The lymphocytic type of cell was most common. A high polymorphonuclear count was noted in the very early stages. All the fluids reduced Fehling's solution. The examination of the spinal fluid may be of value in diagnosis in the preparalytic stages and in abortive cases. It is not of value in prognosis as to life or ultimate recovery.

A. NINIAN BRUCE.

**EPIDEMIC POLIOMYELITIS. FOURTEENTH NOTE: PASSIVE (613) HUMAN CARRIAGE OF THE VIRUS OF POLIOMYELITIS.** SIMON FLEXNER, PAUL F. CLARK, and FRANCIS R. FRASER, *Journ. Amer. Med. Assoc.*, 1913, lx., Jan. 18.

A GIRL, aged 4 years and 4 months, developed acute poliomyelitis. Her father and mother, who were perfectly healthy, were subjected to a naso-pharyngeal irrigation with normal saline. About 150 c.c. of fluid were collected, shaken and pressed through a Berkefeld filter. This fluid was introduced into a *Macacus* as follows: about 1.5 c.c. were injected into the sheaths of each sciatic nerve, and 140 c.c. into the peritoneal cavity. The animal later developed a flaccid paralysis, and sections of the spinal cord after death showed typical lesions of experimental poliomyelitis. An emulsion of the glycerinated spinal cord of this monkey was injected into each sciatic nerve and into the peritoneal cavity of

two *Macacus* monkeys. Both later showed infiltrative lesions of poliomyelitis upon sections of their spinal cords after death.

Although the parents of this case were evidently not suffering from poliomyelitis, yet the washings from the naso-pharynx contained the virus of epidemic poliomyelitis, and thus affords an experimental basis for the belief of the occurrence of passive human carriers of the infection.

A. NINIAN BRUCE

**THE POLYNEURITIC FORM OF ACUTE POLIOMYELITIS: A**

(614) **Clinical and Pathologic Study.** S. LEOPOLD, *Amer. Journ. Med. Sci.*, 1913, cxlvi., Sept., p. 406.

A YOUNG adult female, without any previous illness, was suddenly seized with vomiting, fever, pain in the head and back, followed in several days by pain and paralysis in the lower limbs, together with paralysis of the bladder. The patellar tendon reflexes were absent, there was an unsymmetrical paralysis of both lower limbs with partial areas of hyperthesia, and there was marked tenderness on pressure over the nerve trunks in the paralysed extremities, which persisted until death, two months after the onset.

Microscopically, the anterior horns showed the characteristic picture of the subacute stage of an acute poliomyelitis. The peripheral nerve examined showed no evidence of a primary neuritis.

D. K. HENDERSON.

**NOTE ON A CASE OF CHRONIC INTERNAL HYDROCEPHALUS.**

(615) JAMES RAE, *Lancet*, 1913, clxxxiv., Feb. 15, p. 453.

THE patient was a boy who was subject to convulsions during his first year. He began to take notice and to talk at about the usual age, and had measles and whooping-cough. Shortly before his fourth birthday he seemed to become stupid, and at this time his parents thought his head was enlarging. He was sent to hospital. The chest had marked rickety deformities, the arms were spastic, and the hands clenched. The frontal and right angular veins were very prominent, and when the child cried the external jugular veins became half an inch in diameter. Death took place from pneumonia on the tenth day after admission.

At the necropsy it was found that the torcular herophili contained a pyramidal blood clot lying with its apex towards the straight sinus. The clot was  $1\frac{1}{8}$  in. high, and 1 in. across its base. The association of this condition with hydrocephalus has apparently not been previously recorded.

A. NINIAN BRUCE.

**A CASE OF HEMIPLEGIA AND HEMIANÆSTHESIA WITH**  
(616) **MUSCULAR ATROPHY.** (Su d'un caso di emiplegia ed emianestesia con atrofia muscolare.) E. A. SAGRINI, *Riv. ital. di Neuropat., Psychiat. ed Elettrotet.*, 1913, vi., p. 337.

A MAN, aged 22, developed left hemiplegia with hemianæsthesia and muscular atrophy in convalescence from severe typhoid fever. Some improvement took place in the motility of the left leg, but none in the face, and the anæsthesia and muscular atrophy were unchanged when the patient left hospital six months after the onset of the paralysis.

The lesion was probably situated in the left internal capsule, in which a portion of the posterior limb was involved, and also in the pulvinar. The muscular atrophy is attributed to grave and extensive lesions throughout the course of the pyramidal tract.  
J. D. ROLLESTON.

**SPINAL GLIOSIS OCCURRING IN THREE MEMBERS OF THE**  
(617) **SAME FAMILY, SUGGESTING A FAMILIAL TYPE.** GEORGE E. PRICE, *Amer. Journ. Med. Sci.*, 1913, cxlvi., Sept., p. 386.

THE cases reported occurred in two brothers and one sister, aged 13, 22, and 24 years respectively. The symptoms were practically identical in all these patients.

One of the patients, when 8 years old, developed a sore on the second toe of her right foot, which, after removal of a small spicule of bone, rapidly healed. Two years later a similar condition developed on the second finger of the right hand. The patient stated that she had never been able to properly recognise touch, pain, hot or cold on her hands and feet, but that she could recognise these sensations readily on other parts of her body. An objective examination showed that all forms of sensation were lost in the affected areas. The fingers and toes of both hands and both feet showed marked trophic changes both of the nature of spontaneous amputation and arthropathies. Investigation of the family history failed to disclose any possible etiological factor.

D. K. HENDERSON.

**SYRINGOMYELIA; WITH PATHOLOGICAL FINDINGS.** E. P.  
(618) BERNSTEIN and S. HARWITT, *Med. Record*, 1913, lxxiv., Oct. 18, p. 698.

A WOMAN, aged 49, had suffered from attacks of pain over the sacrum and left leg for nine years. Then both legs became



involved, followed by flaccid paralysis, anæsthesia, bedsores, and death.

The spinal cord showed on section a longitudinal cavity of irregular shape differing at different levels. The microscopic appearance also differed at different levels, but the origin of all the diverse lesions seemed to lie in neoplastic proliferation of glia cells, resulting in the cauda equina in a gliomatous tumour mass.

A. NINIAN BRUCE.

**MILD MANIFESTATIONS OF SYRINGOMYELIA.** With Report of (619) **Three Cases.** C. BURNS CRAIG, 1913, lxxxiv., Oct. 25, p. 747.

*Case I.*—Man, aged 21, engineer and expert violinist, began to find he could not use his left thumb and index finger well. Later, slight numbness developed, and the first movement of the fingers became inaccurate. The arm and forearm show a degree of diminution in volume, which is just appreciable, and there is mild atrophy of the thenar and hypothenar muscles. The left arm is slightly ataxic. He is also completely anæsthesia to temperature and pain from the crown of his head to the tenth dorsal vertebra, and from his chin to the seventh rib, quite symmetrical and including both arms. The cerebro-spinal fluid was negative.

*Case II.*—Man, aged 28, clerk, complained of flattening of the hand at the base of the left thumb. His first symptom was failure to use his arms fully in swimming. The anæsthesia consisted in absence of pain and temperature sense from the occiput to the scapular spine on the left, and to the twelfth dorsal vertebra on the right, and anteriorly from the chin to the third rib on the left and below the umbilicus on the right. In addition certain cardiac symptoms suggested involvement of the vagus nucleus.

*Case III.*—Man, aged 39, bookbinder, typhoid fever at 18, began to notice numbness in the little finger ten years ago; then numbness of all right arm, and later the right little finger began to curl, then his ring finger did the same, and gradual loss of strength occurred in his right arm. Anæsthetic to head, cold and pin-prick was present from the occiput to just below the scapular spine, and from the chin to the second intercostal space, with some involvement of both arms.

A. NINIAN BRUCE.

**INFANTILE CEREBRO-CEREBELLAR DIPLEGIA OF FLACCID**  
(620) **ATONIC-ASTASIC TYPE.** L. PIERCE CLARK, *Amer. Journ. Dis. Child.*, 1913, v., June, pp. 425-446.

THIS is a relatively rare disorder. The disease type is established by pronounced flaccidity, mutism and idiocy. Usually nothing

abnormal in physical and mental make-up is noticed in the child for the first few months after birth. The condition is usually first seen at about one year, when the child attempts movements of its own volition. It is then noticed it cannot sit up, hold up its head, or even stand. There is no atrophy, but the whole musculature is relaxed. The electrical reactions are normal. The most striking symptom is the enormously exaggerated mobility of the joints. Later an ataxy of cerebellar type is superadded, and inco-ordination of all the extremities becomes marked. The positions of the arms and legs are not fixed by proper muscle tone. If the limbs are left to themselves they follow the action of gravity, and when let fall from a lifted position, they hang down in a lifeless manner. Usually the mental deficit amounts to idiocy, or to a low degree of imbecility. There is always a marked speech defect, in most cases amounting to mutism.

The author considers that the condition is the result of an intra-uterine disorder, either inflammatory, hæmorrhagic, or an agenetic disorder of the cerebellum, and a wide and extensive defect of the fore-brain, especially the frontal, parietal, and possibly the temporal cerebral lobes, as a result of which hypotonia, dysmetria, ataxy, inco-ordination, mutism and idiocy result.

A. NINIAN BRUCE.

**EXPERIMENTS ON INTRADURAL ANASTOMOSIS OF NERVES**  
(621) **FOR THE CURE OF PARALYSIS.** W. B. CADWALADER and  
J. E. SWEET, *Med. Record*, 1913, lxxxiv., Nov. 1, p. 800.

ANASTOMOSIS of peripheral nerves for the cure of paralysis has been successful in certain cases of facial paralysis, but when applied to nerves of the extremities the results have not been very encouraging. If crossing the intraspinal motor roots of the spinal cord could be proved to be practicable in man, for the return of at least partial function in paralysis of the bladder from injury to the lumbo-sacral spine, &c., it might be a justifiable procedure in certain cases.

The authors divided intradurally the anterior nerve roots at various levels, and performed cross anastomosis. The paralysis resulting was in no case recovered from, as the cut ends became involved in a great excess of scar tissue, and regeneration did not occur.

A. NINIAN BRUCE.

**DISEASE OF THE ULNAR NERVE AFTER TYPHOID FEVER.**  
(622) (*Zur Kasuistik der Erkrankung des N. ulnaris nach Unterleibstypus.*) B. M. DOLGOPOL, *Zeitschr. f. klin. Med.*, 1912, lxxvi., p. 490.

DOLGOPOL reviews the literature and records a case of right ulnar neuritis in a man, aged 22, in convalescence from severe typhoid

fever. Complete recovery occurred in about six weeks. Dolgopol rejects Bernhardt's view that ulnar neuritis in typhoid is due to mechanical damage from constantly lying on the side of the nerve affected, and regards a toxic origin as much more probable.

J. D. ROLLESTON.

**AGGLUTINATION OF THE TYPHOID BACILLUS BY THE**  
 (623) **CEREBRO-SPINAL FLUID OF THE TYPHOID PATIENT.**  
 (Agglutination du bacille d'Eberth par le liquide céphalo-rachidien du typhique). R. BRANDEIS and C. MONGOUR, *Compt. rend. Soc. de Biol.*, 1912, lxxiii., p. 140.

THE presence of agglutinins in the cerebro-spinal fluid of persons suffering from microbial infections is so exceptional that the present case is worthy of note. The patient was a woman who had clinical evidence of typhoid fever, but an obstinate headache of a month's duration suggested the possibility of meningitis. Widal's reaction was positive. The cerebro-spinal fluid showed no leucocytosis, and only a few red cells, but it agglutinated typhoid bacilli, though in a somewhat lower dilution than in the case of the blood serum—1 in 60 as compared with 1 in 80.

J. D. ROLLESTON.

**SLOWLY DEVELOPING SUPRARENAL INSUFFICIENCY OF**  
 (624) **CEREBRAL FORM FOLLOWING TYPHOID FEVER.** (*Insuffisance surrénale lente à forme cérébrale consécutive à une fièvre typhoïde.*) R. DONNIS, *Arch. de méd. et de pharm. mil.*, 1913, li., p. 567.

A SOLDIER, aged 22, two months after a severe attack of typhoid fever, developed signs of suprarenal insufficiency characterised by circulatory troubles (hypotension and coldness of extremities), digestive disorders (anorexia, constipation, and persistent vomiting), nervous symptoms (lumbar and abdominal pain, headache, and profound neurasthenia), and general disturbance (anæmia, loss of flesh, and hypothermia). In addition to these signs of suprarenal insufficiency were some puzzling cerebral phenomena, viz., constant melancholy, delusions, and nightmares. Progressive improvement took place under the administration of adrenalin. The slow development of the symptoms is attributed to a sclerotic change in the suprarenals, following the acute inflammation produced by typhoid fever (*cf. Review*, 1912, x., p. 243).

J. D. ROLLESTON.

**A VERY SUCCESSFUL NEW METHOD OF CURING HYSTERICAL APHASIA.** (625) **CAL APHASIA.** (Un nuovo metodo molto efficace per guarire l'afasia isterica.) PROF. CITELLI, *Riv. ital. di Neuropat., Psychiat. ed Elettrot.*, 1913, vi., p. 385.

IN a paper read before the fifteenth section of the Seventeenth International Congress of Medicine, Professor Citelli describes the following method for curing hysterical aphasia. While engaged in quiet conversation with the patient or his friends fix the back of the patient's neck with the left hand, and then suddenly grasp with the index and thumb of the right hand the sides of the thyroid and hyoid cartilages, and exercise upon them a pressure which should rapidly be made strong and slightly painful. The patient, alarmed by this procedure, tries to cry out, but should be plied with a number of questions in rapid succession. He thus escapes from the special state of consciousness which rendered him aphasic, and replies in a clear voice. To avoid a relapse compel the patient to continue speaking distinctly. Citelli has successfully treated four cases by this method, two in men and two in women, including an old maid of 60 who had been aphasic for three years.

J. D. ROLLESTON.

**DEATH FROM SYPHILIS OCCURRING NINE DAYS AFTER INJECTION OF SALVARSAN.** (626) Capt. J. H. DUGUID and Lieut. W. T. GRAHAM, *Jour. Roy. Army Med. Corps*, 1913, xxi., p. 582.

A MAN, aged 28, who had contracted syphilis eighteen months previously, was given an intravenous injection of 0.6 gm. salvarsan. The primary lesion had rapidly yielded to injections of mercury, and at the time of injection of salvarsan he had no signs of active disease, and did not complain of anything. Six days after the injection he had headache, malaise, and rise of temperature, and the following days a series of epileptic fits, which continued till death. Post mortem a gumma was found 4 cm. in diameter just external to the anterior horn of the right lateral ventricle. In addition to the usual caseous material, the gumma contained a considerable amount of fluid blood, pointing to hæmorrhage of some days' duration. The writers think that salvarsan caused a local reaction in the gumma, and thus produced symptoms which might have remained in abeyance.

J. D. ROLLESTON.

**A REPORT OF SEVEN CASES OF SYPHILIS APPARENTLY CURED WITH ONE INJECTION OF SALVARSAN.** (627) A. L. WOLBARST, *New York Med. Journ.*, 1913, ii., p. 747.

THE patients received no other treatment beyond a single intramuscular injection of salvarsan. They all became and remained

perfectly well. The period of observation since the injection ranged from two years and ten months to two years and one month. In four cases Wassermann's reaction was taken, and was persistently negative. Two of the patients were in the primary, two in the secondary, and three in the tertiary stage at the time of injection.

J. D. ROLLESTON.

**THE PREVENTION OF EPILEPSY.** L. PIERCE CLARK, *New York* (628) *Med. Journ.*, 1912, Dec. 14.

AFTER a brief discussion of this subject, the author points out that the prevention of epilepsy is closely bound up with: (1) a more precise and intensive study of family stock from which the disease is recruited; (2) birth injuries and accidents must be still further eliminated; (3) the rearing of neuropathic individuals must be given more definite and painstaking attention; and (4) proper metabolism in potentially epileptic individuals must be still more energetically safeguarded.

A. NINIAN BRUCE.

**PSYCHIC EPILEPSY WITHOUT OTHER PHENOMENA.** GEORGE (629) E. PRICE, *Journ. Nerv. and Ment. Dis.*, 1913, xl, Sept., p. 580.

THE case of a man, 42 years, who had always been irritable, and who in September 1912 was suddenly found in a confused condition and entertaining the delusion that a man was in the room, whom he was apparently trying to shoot by snapping an empty revolver. In less than an hour his mind cleared, and he had no recollection of what had occurred. He then complained of headache, and wanted to sleep. Seven such attacks occurred during the following five weeks. He would always be found in a confused, hallucinatory, and delusional state, always believing a strange man was in the room, and entertaining in a more or less vague way the delusion of marital infidelity. The attacks lasted from fifteen minutes to one hour, and were always followed by headache.

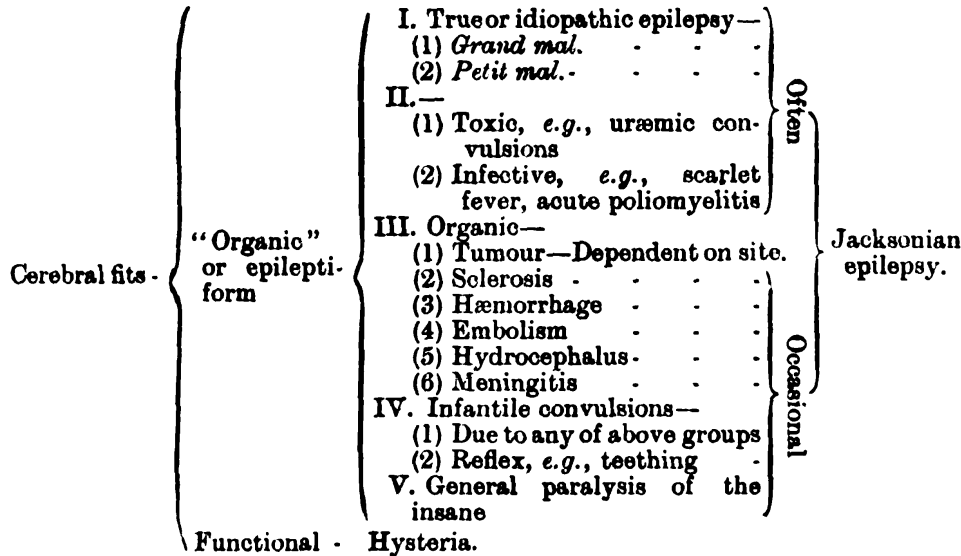
The physical examination was negative; there were no hysterical stigmata.

Under rest and bromide treatment the attacks disappeared for a period of three months, but subsequently returned.

D. K. HENDERSON.

**THREE CASES OF "FITS."** ROBERT A. FLEMING, *Clin. Journ.*, 1913, (630) xlii., Aug. 13, p. 300.

THE author classifies fits as follows :—



A. NINIAN BRUCE.

**TRAUMATIC NEURASTHENIA.** H. CAMPBELL THOMSON, *Journ. of (631) Mental Sci.*, 1913, Oct., p. 582.

THE author discusses the limitations of the term traumatic neurasthenia, and considers that it should include all cases of neurosis resulting from shock to the mind in connection with an accident, even though there may be no physical injury. It is the fear of trauma, rather than the trauma itself, that leads to the neurosis, the amount of shock being often disproportionate to the degree of danger experienced. Indeed, the trauma may affect one person and the neurasthenia another.

The latent period in genuine cases is not usually longer than a week or two, and cases in which the symptoms are delayed much longer than this should be looked upon with suspicion.

The author believes that the symptoms are due to the inhibition of the action of those cortical cells which control the thalamic centres, the latter being intimately related to the emotions, and forming part of Langley's autonomic system.

Treatment of sixty cases resulted in thirty-nine resuming work, nine are permanently disabled, three have become insane, and in nine the results are uncertain.

W. D. WILKINS.

**DELIRIUM TREMENS? DUE TO STRAMONIUM POISONING.**  
 (632) (*Un cas de delirium tremens ? dû à intoxication par le datura stramonium.*) BOGHASSIAN, *Arch. Internat. de Neurol.*, 1913, xxiv, Nov., p. 290.

THE author reports the case of a woman of 43 in whom bizarre effects of stramonium poisoning lasted so long as seventeen days. Bazil states, after a long experience in India, that the mental effects of stramonium last for only five or six days. Pachagan observed a whole Armenian family thus poisoned, with a duration of mental symptoms for only four or five days. The author attributes the long duration in his own case to the heredity of the patient: the father was alcoholic and of irritable character, and died delirious in pneumonia; the mother showed of late symptoms of organic dementia; a maternal aunt had an attack of acute mania with perfect recovery; another maternal aunt showed paranoia since age of 15, and is now under the author's care. There was also plenty of insanity in more distant relatives. There was no consanguinity of the patient's parents. A graphic description is given of the patient's terrifying visual and aural hallucinations.

LEONARD J. KIDD.

**AN INTENSIVE STUDY OF INSECTS AS A POSSIBLE ETIOLOGIC**  
 (633) **FACTOR IN PELLAGRA.** A. H. JENNINGS and W. V. KING,  
*Amer. Journ. Med. Sci.*, 1913, cxlvi., Sept., p. 411.

A SUMMARY of the results obtained is given: Ticks, lice, bed-bugs, cockroaches, horse-flies, mosquitoes, buffalo-gnats (*Simulium*), house-flies, and stable-flies (*Stomoxys*) were under consideration. Horse-flies have nothing, and cockroaches little, to support them. Most of the other insects are ruled out for various reasons, but it is stated that the stable-fly (*Stomoxys calcitrans*) displays certain salient characteristics which seem to qualify it for the rôle of a transmitter of pellagra. The characteristics mentioned are not convincing.

D. K. HENDERSON.

**A CASE OF TETANUS TREATED BY INTRAVENOUS INJECTIONS**  
 (634) **OF PARALDEHYDE AND COPIOUS INJECTIONS OF**  
**NORMAL SALINE RESULTING IN CURE.** OLIVER ATKEY,  
*Lancet*, 1913, clxxxiv., Jan. 18, p. 468.

A BOY, aged 19, was admitted to Khartoum Civil Hospital for septic tuberculous sinuses of the neck. Two days later he developed tetanus. The neck was very rigid, and opisthotonos was marked during the spasms. He was given a large number

of doses of paraldehyde and ether intravenously in normal saline solution. This produced deep anæsthesia immediately, and acted not only as an anæsthetic but as a hypnotic, and thus preserved the patient from the rapid exhaustion entailed by the muscular contractions and pain, while the body was given time to eliminate the tetanus toxin. At the same time the sinuses were laid freely open and the activity of the bowels attended to. In this case the strength and nutrition of the patient was well maintained during the eight days he was suffering from tetanic symptoms, and he was ultimately discharged quite well. A. NINIAN BRUCE.

**ON A CASE OF ADDISON'S DISEASE IN A BOY AGED 10 YEARS.**  
(635) FREDERICK LANGMEAD, *Lancet*, 1913, clxxxiv., Feb. 15, p. 449.

A BOY, aged 10 years, was admitted to the Royal Free Hospital on 17th September 1912, and died four hours later. On the evening before, vomiting had started abruptly, accompanied by restlessness and followed by loss of consciousness. The pulse was rapid and weak, and the temperature subnormal. Frequent convulsions occurred until death. The urine and cerebro-spinal fluid showed nothing abnormal. A slight diffuse brownness of the skin was noticed, which the mother had noticed to have gradually deepened for about twelve months.

The suprarenal glands were fibro-caseous almost throughout, merely a narrow margin of healthy gland tissue being discernible in a few areas. The sympathetic ganglia were not recognised. Tubercular foci were found in the lungs and elsewhere.

A. NINIAN BRUCE.

**PSYCHIATRY.**

**THE BACTERIOLOGICAL EXAMINATION OF THE URINE IN  
(636) SOME CASES OF GENERAL PARALYSIS.** E. BARTON WHITE,  
*Journ. of Mental Sci.*, 1913, Oct., p. 596.

AN examination of the urine was made before and after treatment by hexamethylenetetramine. Before treatment the urine contained micro-organisms in every case, variously the *Bacillus coli communis*, a diphtheroid bacillus, a staphylococcus, a streptococcus, and in one case a diplococcus. These all disappeared after treatment, except in the case of the diplococcus, this being also the only one in which formaldehyde was not found in the urine.

The author considers that the treatment had a favourable effect in clearing up secondary infections, and in thus delaying the onset of the third stage. W. D. WILKINS.



**THE WASSERMANN REACTION AMONG THE NEGRO INSANE (637) OF ALABAMA.** R. R. IVEY, *Med. Record*, 1913, ii, p. 712.

IVEY examined the blood of 706 patients. The total number of males examined was 357, of whom 95, or 25 per cent., were positive. 349 females were examined, of whom 102, or 29 per cent., were positive. There was nothing characteristic in the mental condition of the positive or negative cases, save one feature, viz., 17 cases of general paresis, 15 in men and 2 in women, all gave a positive reaction. Among the 90 males, 48 gave clinical signs of syphilis, such as adenopathy, pigmentation of skin, and exostoses, and among the females 49 gave similar evidence.

J. D. ROLLESTON.

**THE RÔLE OF SYPHILIS IN MENTAL DEFICIENCY AND (638) EPILEPSY: A REVIEW OF 205 CASES.** KATE FRASER and H. FERGUSON WATSON, *Journ. of Mental Sci.*, 1913, Oct., p. 640.

THESE investigators conducted their researches independently, no comparison being made until the investigations were complete. The blood sera of mentally defective and epileptic children was examined for the Wassermann reaction, and in many cases the relatives of the patients were examined in the same way.

Dr Fraser obtained a positive reaction in 44.90 per cent. of a group of 89 mentally defective children, and this percentage was raised to 57.70 per cent. when those cases were included in which a positive reaction was obtained in some other member of the family, but not in the patient. The number of positive reactions was almost the same in the epileptic children as in those without epilepsy.

Dr Watson examined 105 defectives, and obtained a positive Wassermann in 48.50 per cent., a percentage which was raised to 58.10 per cent. when the relatives were included, so that the results obtained by the two observers were very similar, and show that a syphilitic taint is present in a large proportion of weak-minded and epileptic children.

W. D. WILKINS.

**ICHTHYOSIS WITH MENTAL DEFICIENCY. (Note sur un cas (639) d'ichthyose avec débilité mentale.)** C. PARHON and C. DAN, *Bull. Soc. Sci. méd. de Bucarest*, 1911-12, p. 62.

A CASE of mental debility dating from childhood in a man, aged 31, accompanied by almost generalised ichthyosis, slow pulse, marked mononucleosis, and an impalpable thyroid. The condition was attributed to thyroid insufficiency with which disturbance of other glands of internal secretion was possibly associated.

J. D. ROLLESTON.

**DYSENTERY, PAST AND PRESENT.** H. S. GETTINGS, *Journ. of* (640) *Mental Sci.*, 1913, Oct., p. 605.

AN interesting account of the history of dysentery in England, first as a general epidemic disease, and later as an asylum infection, exemplified more especially in the annals of Wakefield Asylum. The author has traced cases in almost every year since 1818, the date the asylum opened, but shows that there have been six epidemics, each having approximately a ten year cycle, with a gradual rise and fall. At the end of each epidemic the authorities claimed that the reduction in the number of cases was due to the measures they had undertaken.

W. D. WILKINS.

**ON THE BACTERIOLOGY OF ASYLUM DYSENTERY IN** (641) **ENGLAND.** D. M'KINLEY REID, *Journ. of Mental Sci.*, 1913, Oct., p. 621.

THIS important essay has been awarded the Bronze Medal of the Medico-Psychological Association. It is the account of some careful and elaborate researches having the object of deciding which type of *B. dysenteriae* is the cause of asylum dysentery.

Thirty-five cases were investigated, many both before and after death, and in twenty-eight of these cases organisms of the Flexner type were isolated, no bacilli of this type being obtained from twenty control cases, and the Shiga type not being found at all. It was shown that the earlier in the course of the disease the faeces were examined, the greater was the likelihood of the bacilli being isolated.

The author has further been able to group the bacilli he found into six distinct strains, differing distinctly from each other in cultural characters, but all being mannite-fermenting, and therefore akin to the Flexner type. He has been able to identify these strains, more or less closely, with those described by various observers in other epidemics.

Further tests were made of the agglutinating properties of the serum from these cases, and the presence of the Flexner bacillus was confirmed. Intravenous inoculation of the cultures was found by Dr Macalister to be fatal to rabbits, and the post-mortem appearances closely resembled those in early dysentery in the human subject. Feeding experiments were carried out on rabbits by Dr J. Walter Macleod for the author, but, strangely enough, the results were negative in all cases.

The author considers that serum treatment offers the greatest hopes for the future, and is well worth further investigation.

W. D. WILKINS.

**A DIFFICULT DIAGNOSIS IN AN INSANE PERSON.** ROBERT (642) JONES, *Brit. Med. Journ.*, 1913, Aug. 30, p. 533.

A MAN, aged 48, blind from double cataract, had been in Claybury Asylum for about sixteen years suffering from maniacal excitement, with delusions of persecution; he was also a case of congenital weak-mindedness. He was taken suddenly ill on 21st May, and died on 23rd May. He complained of pain in the upper part of the abdomen, which did not move during respiration. The pulse was over 130. He vomited some "coffee-ground" matter, became weaker, and sank into a semi-conscious condition. A perforated duodenal ulcer was found at the autopsy.

A. NINIAN BRUCE.

## Reviews.

**AUS DEM SEELENLEBEN DES KINDS.** Dr H. VON HUG-HELLMUTH, (643) 1913. Pp. 170. Deuticke, Vienna. Pr. M. 5.

AN attempt is here made systematically to describe the development of the child by the help of the increased knowledge of this period of life that has resulted from psycho-analytic investigations. The book is divided into two parts, one dealing with the infantile period, the other with the later "play" period. The chapters of the first are entitled—1. The functions of sense in the service of feeling; 2. The first manifestations of the will; 3. The first signs of the development of understanding; 4. The beginnings of speech; 5. The sources of ethical feelings; 6. Dreams. Of the second—1. The body and its functions in the service of the play instinct; 2. The development of understanding; 3. Memory; 4. Phantasy; 5. Reason; 6. Speech; 7. Emotional life; 8. Art in the life of the child; 9. Dreams. A study of the classical observations of Compayré, Scupin, Preyer, Stern, &c., is given, but the greater part of the book is taken up with the author's own observations. The main purpose of the work is to investigate the aspects of childhood life to which Freud has called special attention, such as the importance of the early emotional life, of mental conflicts, of repression, and of the childhood form of sexuality. The other aspects that are more usually considered are by no means neglected, though they are chiefly studied in relation to these.

The value of the book resides in the material added to that already published, which goes to show that the conclusions on childhood life, drawn by Freud from psycho-analysis of the adult,

can be fully confirmed by direct observation of the child itself, if only precautions are taken not to overlook or underestimate them in the way usually done.

ERNEST JONES (London).

**MENTAL DISEASES.** By Dr R. H. COLE. University of London Press, (644) 1913. Pp. 343. Pr. 10s. 6d.

THIS is a new text-book of psychiatry, evidently designed for students. The first chapter, which in the reviewer's opinion is the best in the book, deals in a very interesting manner with the history of insanity and its treatment. Then follow four clearly written chapters on normal psychology; these, together with the chapter on the neuroses, have been reviewed elsewhere by the present writer (in the *Journal of Abnormal Psychology*), so that attention will be confined here to the clinical and pathological sides.

It is plain that a great amount of work has been put into the book, which is on the whole a very creditable production. The best features of it are the general clearness of exposition, with a vivid and easy style of writing, the clinical descriptions, the section on the legal aspects of insanity, and the well-reproduced photographs and beautiful coloured illustrations. Much of the content, however, is less satisfying than the form. The impression of modernity that one gets, for instance, from seeing references to Mendel, and even casual ones to Freud, is not altogether maintained by closer inspection. One dare hardly say, for example, ten years after the work of Apathy and Bethe, that "the neurone theory is practically accepted by neurologists" (p. 22). In the section on general paralysis no mention is made of the Wassermann reaction; it is true that this is referred to in the chapter on pathology, but only in a brief sentence that gives the reader no idea of the diagnostic value, the pathological significance, or even the nature of it.

A few points in the book may be selected for comment. In sensory aphasia the mental defect is one of apperception, not of perception (p. 36). We read (p. 95) that "the sexual nature can be repressed with safety, provided, &c.," where the writer probably meant "suppressed," an alteration which would bring the statement nearer the truth, without, however, making it true. That mental shock "produces about 1 to 2 per cent. of cases of insanity" (p. 98) is a dangerous remark to insert in a text-book, as it conveys an obviously false impression of simplicity and accuracy. The misleading term, "maniacal-depressive insanity," is used (p. 105); Kraepelin did not, as the author states, introduce this term, for, in common with most other psychiatrists, he speaks

of manic-depressive insanity. Stupor is still considered to be a type of insanity, instead of, as with all modern writers, merely a symptom, and the term "amentia" is deflected from its ordinary connotation of the psychosis described by Wernicke to signify a primary mental deficiency.

The gravest error in the book, in the writer's opinion, is that concerning the attitude adopted towards dementia præcox. This is considered in the same chapter as, and thus on a level with, the terminal states of alcoholic, presbyophrenic, and epileptic psychoses, and of others with gross organic disease. Now, without going into the vexed question of the histopathological changes found in this condition, it is quite certain that it differs fundamentally in nature from the "dementias" accompanying gross organic disease. To take one point alone, it is now known that no dementia, properly speaking, ever occurs in the disease, which psychological investigations have shewn to be characterised by the most productive and significant mental activity. No hint is given to the student that the name of the disease is merely of historic interest, and it is grouped together with conditions that may well come under the definition of dementia given by the author (p. 132), as a state "exhibiting an absence of mental functions due to organic destruction of nerve cells, and without hope of recovery." This accords with the author's treatment of the pathology of dementia præcox, by which he means only morbid anatomy, not a single word being said of all the extensive and fruitful work of recent years on the psychopathology of the condition. The difficult and important question of the diagnosis between it and manic-depressive insanity is practically ignored, for in the chapter on the latter condition we find only that "dementia præcox may be excluded by the gradual onset (what about the acute outbursts of catatonic excitement?), together with the weak-mindedness and mannerisms accompanying it" (p. 120). By the way, one is astonished to read (p. 156) that the term dementia præcox was first applied by Pick in 1898; it was coined by Morel half a century ago, and has enjoyed a wide circulation ever since, though it is only a couple of years since it has come into use amongst English psychiatrists.

On the whole the book may be regarded as a fairly presentable account of the subject, written very conventionally, and with a pronounced cautiousness towards any new or original ideas, and of unequal value. Some of the good and bad features have been pointed out above, and similar criticisms could be applied to almost every section; for instance, the chapter on morbid anatomy is very good so far as macroscopic work is concerned, but fails to give any adequate conception of the more important histopathological side, on which so much work has been done in recent years.

In the second edition, which we may anticipate with confidence, we hope to find evidence of a thorough revision, when one will then, no doubt, be able to recommend it more cordially to students of the subject.

ERNEST JONES (London).

**INTERNATIONALE ZEITSCHRIFT FÜR ÄRZTLICHE PSYCHO-**  
(645) **ANALYSE**. Jahrgang I., Heft I., January 1913. Heller, Vienna.  
Pr. M. 18 yearly.

THIS new journal, which replaces the *Zentralblatt* as the official organ of the International Psycho-Analytic Association, is directed by Professor Freud, and edited by Drs. Ferenczi and Rank (now also by the reviewer). It appears every other month, alternately with *Imago*, the psycho-analytic journal devoted to non-medical investigations, each number containing about 120 pages.

The first number is divided into eight parts: I. *Original Articles*. There are five of these, as follows: Freud, "Further Advice on the Technique of Psycho-Analysis." This is one of a series of papers that Freud has for some time been publishing on the subject of technique. Ernest Jones, "The Relation between the Anxiety Neurosis and Anxiety Hysteria." Seif, "The Psychopathology of Morbid Anxiety." Federn, "Contributions to the Analysis of Sadism and Masochism." Rank, "The Matron of Ephesus." II. *Shorter Communications*. These are grouped according to subject, e.g., infantile life, dream interpretation, &c. III. *Criticisms and Reviews*. IV. *Reports of Societies and Meetings*. V. *Correspondence*. VI. *Various*. Quotations from writers, &c. VII. *Bibliography*. A bibliography of the works published on this subject and on allied ones is printed in every number. VIII. *Korrespondenzblatt of the International Association*. Reports of the constituent societies, &c. The journal is printed mainly in German, but papers can also be published in English and French.

This is not the place to offer a detailed criticism of the new journal, which would obviously involve one of psycho-analysis itself. One need only point out that to those working at, or seriously interested in the subject, this journal is literally indispensable.

ERNEST JONES (London).

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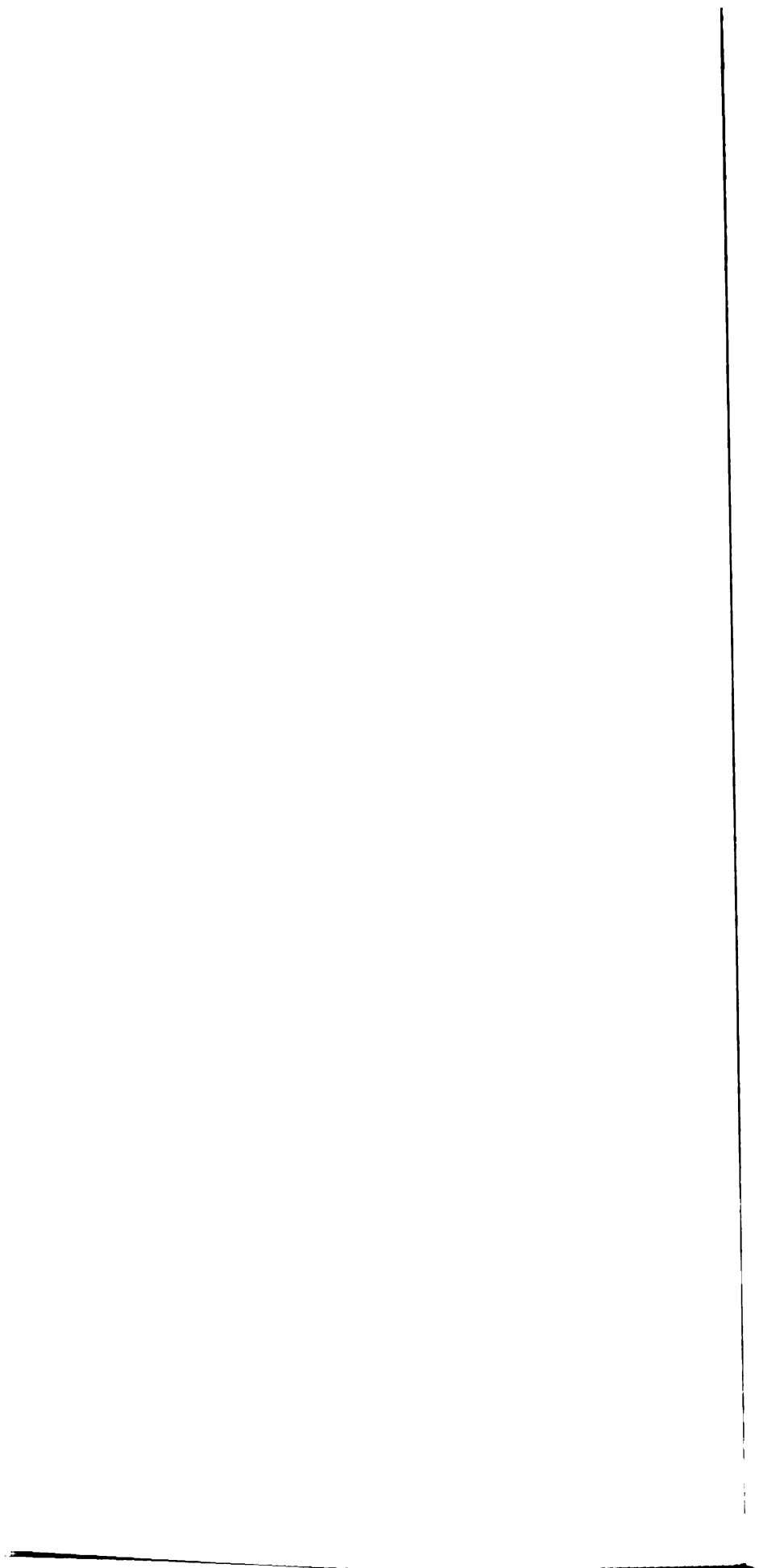


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